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AN
EXPERIMENTAL STUDY OF
THE MENTAL PROCESSES
INVOLVED IN JUDGMENT

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CHICAGO

The University of Chicago Press
(Agent for the United States)

BOMBAY CALCUTTA AND
MADRAS

Macmillan and Co., Ltd.

TORONTO

The Macmillan Co. of Canada, Ltd.

TOKYO

Maruzen-Kabushiki-Kaisha

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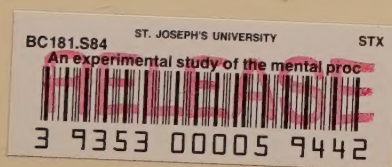
54 AN
EXPERIMENTAL STUDY OF
THE MENTAL PROCESSES
INVOLVED IN JUDGMENT

*Thesis approved for the Degree of Doctor of Philosophy
in the University of London*

BY
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CAMBRIDGE
AT THE UNIVERSITY PRESS
1927

PRINTED IN GREAT BRITAIN

P R E F A C E

THE Experimental Study of the Mental Processes Involved in Judgment is a thesis embodying the results of a research carried out in the Psychological Laboratory of the University of London King's College during the Sessions 1923–1926, and accepted by the University of London for the degree of Ph.D.

I desire to express my indebtedness to the University of London Grants Committee and to the Serbian Minister's Fund Committee in London for grants which have enabled me to publish it, also to the latter body for a scholarship without the aid of which the research could not have been carried out.

I wish also to record my deep gratitude to Dr Francis Aveling, head of the Department of Psychology, University of London King's College, for his invaluable help and advice given throughout the course of the research and for his kindness in reading drafts of my manuscript and proofs.

My thanks are also due to those who so kindly acted as subjects for the research—F. Aveling, M.C., Ph.D., D.Sc., D.D.; Rev. R. C. M^cCarthy, M.A., Ph.D.; Miss H. Wells, Ph.D.; Mr J. A. Tayler; and I take this opportunity of thanking them for their generous co-operation.

BORISLAV P. STEVANOVIĆ

BEOGRAD.

March, 1927.

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AN EXPERIMENTAL STUDY OF THE MENTAL PROCESSES INVOLVED IN JUDGMENT

INTRODUCTION¹

PURPOSE OF THE RESEARCH. MATERIAL. METHOD.
APPARATUS. OBSERVERS.

THE present research was planned to study the mental processes involved in judgment. It was divided into two parts: that, viz. in which material was learned to serve in the making of the judgments, and that comprising the actual making of the judgments themselves. As the first part (the learning), which was very extensive, was performed under controlled conditions, we considered it worth while to pay attention to any point that might arise with regard to the problem of the development of meaning—i.e. abstraction, generalisation, etc. During the second part of the experiments, which was intended to be the principal part of our work, besides the cognitional we kept in mind also the conational aspect of the mental processes of judgment.

We have endeavoured to collect as much objective data as possible in order to reach a quantitative determination of the phenomena. While introspections were recorded throughout in both parts of the experiments, the only quantitative data in the first part consisted in reaction times taken by a stop-watch and drawings made by the observers in different stages of the learning process. Special attention was devoted to these drawings, as we thought that they might be significant with regard to the developmental aspect of the meaning of the pictures during the course of learning. In the second part of the experiments Hipp's chronoscope was employed to measure the time intervals, and photographic records were taken of the changes in the electrical resistance of the observers during the performance of the task. We thought that we might get some objective indication

¹ The publication of this work has been aided by a grant from the Publication Fund of the University of London.

of the conational phenomena by means of the psycho-galvanic reflex. Previous work¹ carried out in the Psychological Department of the University of London King's College, has furnished some evidence that the changes in the electrical resistance of the observer's hand were correlated with conational phenomena in consciousness.

The material employed in these experiments consisted of 35 pictures divided into seven sets. The five pictures of each set consisted in varied drawings of the same pattern differing in colour. These drawings were obtained by tracing the shadow projections of a single shaped card (pattern of the set) when held at different angles to the paper on which the shadows were thrown. The pictures of the different sets represented varying degrees of difficulty in being regarded as examples of the same pattern.

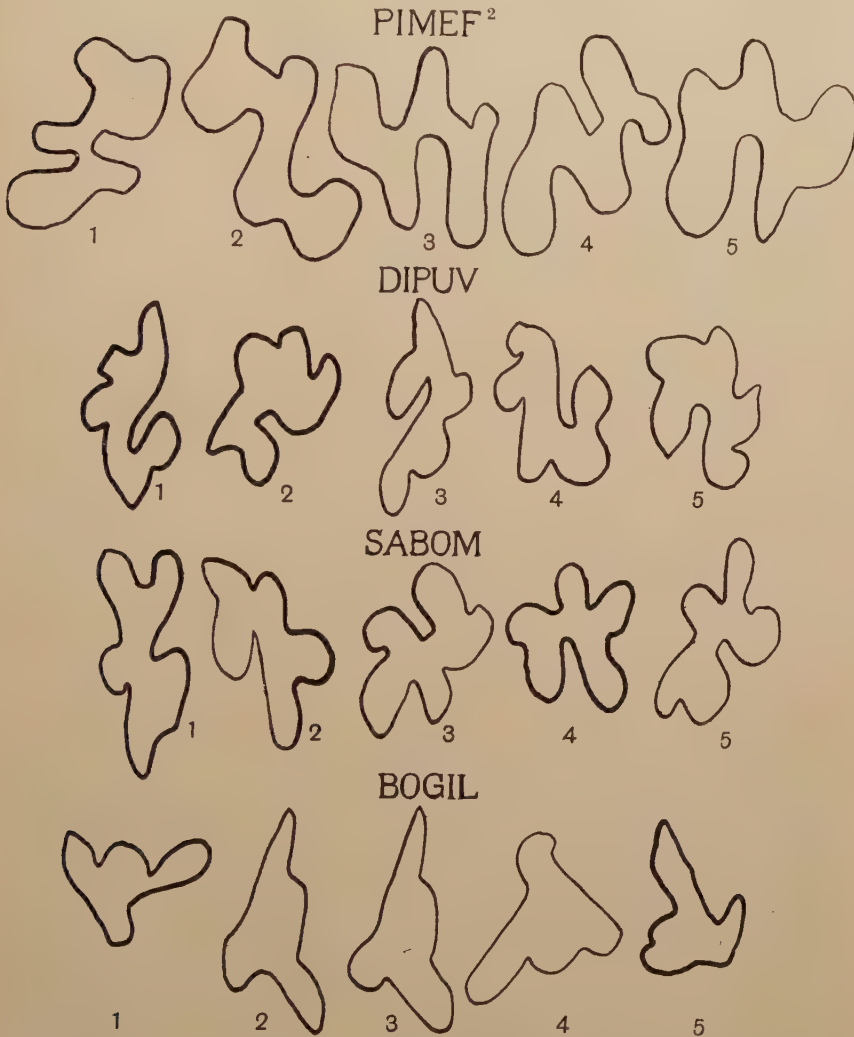
All the pictures were painted in on squares of white cardboard of the same size. In order to have names for the pictures in the "completion experiments," each set had a meaningless word given to it as a name. These names were printed on small cards, and were attached to the picture cards while they were being learned. Our intention was not to study how these meaningless words acquired their meaning, nor how they functioned afterwards in the judgments; but rather to observe how the pictures became meaningful, and how the general meaning of the set, as an abstract concept, developed. The meaningless words, associated with them in the learning process, had to serve as the only extrinsic indication that different pictures belonged to the same set. Later on these words were used to stand for subjects of the judgments in part-sentences exhibited for completion by the observers.

The words used were five-lettered ones of two syllables each. The precaution was taken in constructing the words to avoid the formation of possible mnemonics. The same precaution was observed in making the pictures; but the experimenter could not of course prevent the observers from interpreting the pictures (cf. e.g. the spontaneous interpretation of "ink-bLOTS") and pronouncing the words, although these were conceived phonetically, in their own way. Of the seven words two began with the same letter. It was thought that this might lead to a confusion of the pictures of the two sets learned with these words, and that later on this might be compared with the

¹ Wells, H. M., *The Phenomenology of Acts of Choice* (in press), and McCarthy, R. C., *On the Measurement of Conation*, Chicago, 1926.

confusion, if there were any, obtaining between the pictures of the same set (on the ground of their intrinsic characters)¹.

The sets of the pictures and the words as their respective names, were the following:

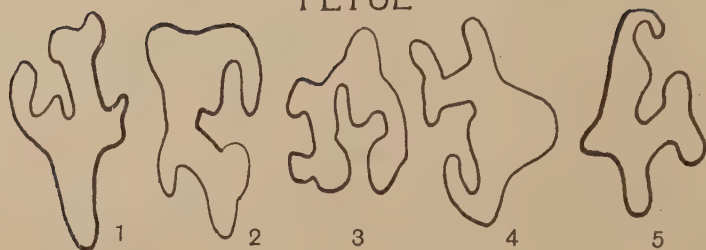


¹ Confusion is regarded by Spearman as one of the ways of forming concepts. See Spearman, C., *The Nature of 'Intelligence' and the Principles of Cognition*, London, 1923, p. 268.

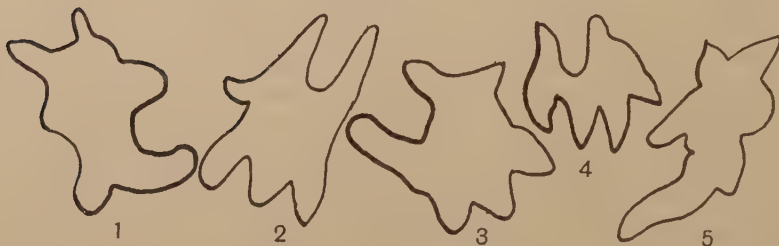
² The drawings shown here are $\frac{2}{3}$ of the original size.

INTRODUCTION

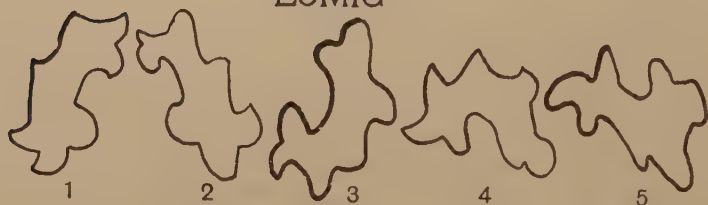
PETUL



MEVOZ



LUMIG



The method, both in learning the material and in the completion of the judgments (completion of part-sentences), was a slight modification of the method used in Aveling's work, *On the Consciousness of the Universal and the Individual*¹. The observers learned the pictures with their associated names during the first part of the experiments. The picture and the word attached to it were exposed on the table in front of the observer. He was given the instruction *to regard the picture and the word attentively while repeating the latter aloud*. About $1\frac{1}{2}$ seconds before exposing them both a warning—"Attention"—was given, while at the actual exposition the word "Now" was the signal to begin learning. At this moment the stop-watch was started. Seven pictures, representing the same relatively placed members of

¹ London, 1912.

5

The order of the sessions in which the different pictures were presented for learning is given in the following table. The roman numerals represent the different sets, while the arabic numerals indicate the different pictures belonging to the same set.

1st day	I 1	II 1	III 1	IV 1	V 1	VI 1	VII 1
2nd "	I 1	II 1	and so on				
3rd "	I 1	II 1	"				
4th "	I 2	II 2	"				
5th "	I 2	II 2	"				
6th "	I 3	II 3	"				
7th "	I 3	II 3	"				
8th "	I 4	II 4	"				
9th "	I 4	II 4	"				
10th "	I 5	II 5	"				
11th "	I 5	II 5	"				
12th "	I 1	II 1	"				
13th "	I 2	II 2	"				
14th "	I 2	II 2	"				
15th "	I 3	II 3	"				
16th "	I 3	II 3	"				
17th "	I 4	II 4	"				
18th "	I 4	II 4	"				
19th "	I 5	II 5	"				
20th "	I 5	II 5	"				
	etc.						
26th "	I 1, 2, 3, 4, 5	II 1, 2, 3, 4, 5	III 1, 2, 3, 4, 5	IV 1, 2, 3, 4, 5	V 1, 2, 3, 4, 5	VI 1, 2, 3, 4, 5	VII 1, 2, 3, 4, 5
27th "	I 1, 2, 3, 4, 5	etc.					
28th "	I 1, 2, 3, 4, 5	etc.					
	etc.						

After 25 sessions had been completed in this way (all pictures having thus been learned five times twice over) another manner of presentation of the pictures was adopted. Instead of exposing in one session a series of the pictures representing the corresponding members of different sets, the seven complete sets of five pictures each (see the 26th day in Table I) were all presented for learning on each day. This time the sets (the whole set of five pictures exposed simultaneously) were learned with their respective names attached to the group and with numerals attached to the individual pictures of the group. In each session all the sets were exposed one after another twice for 30 and 15 seconds respectively. The reactions as before were taken after the learning of all the sets was completed. The reason for adopting at this juncture this method of presenting the material was to ascertain whether, and to what extent, learning of this kind influences abstraction. At the same time this was intended greatly to help the learning of the material, which had proved to be exceedingly difficult. (In this way there would be a greater chance of comparing the individual pictures of the same set, of noticing their sequence and place in the series, and the like.)

All the observers had thus from 30 to 40 learning sessions each. The criterion for the number of sessions necessary for each observer was the following: to learn the pictures and their names sufficiently well to know them as material for the "completion experiments," and not quite so well as to make the completion too easy and automatic.

In three sessions, during the period when all the pictures of each set were learned together, the names were exposed with numerals prefixed as stimuli for reaction (e.g. first BOGIL, second MEVOZ, fifth SABOM). While the names represented the sets, the numerals were intended to function as indicating the individual pictures. These reactions were taken for all the observers with the purpose of ascertaining whether, during the learning period, they might give any indication with regard to any difference between individual as compared with general meaning, if such had already developed. This was regarded also as a short preliminary practice for completing the part-sentences.

No instructions were given to the observers to pay any special attention to finding out common characters of the pictures, or to regard them as belonging to a group. The names were only extrinsic class indicators. The same rule was observed with regard to intro-

spections. They were not asked to pay special attention to any one mental process rather than to any other. They were simply asked to report any mental phenomena occurring in their consciousness from the moment of the giving of the signal until their reaction. But they were asked to report in a separate note any additional knowledge of the picture which might develop after the introspective period had passed. Questions were avoided except those necessary to clarify the text of the protocols.

The whole material for analysis in this part of experiments consisted of 1216 introspection protocols, an equal number of reaction times and 856 drawings performed by the observers in different stages of learning.

The second part of the experiments consisted in completing the sentences to be formed from the learned material. Each was to have the form of a proposition, in which the name of a picture or of a set of pictures was given as subject. In some sentences the subject was quantified and in some qualified by a prefix word; or it was employed without any prefix. The prefix words used were: *all, some, first, second, blue, red, no*, etc. Cards with printed part-sentences (e.g. SOME MEVOZ ARE —, ALL BOGIL ARE —, SECOND SABOM IS —, FIRST LUMIG IS NOT —, etc.) were presented in an exposition box standing in front of the observer, who was seated before it. The electrodes were attached to the observers and were connected with the psychogalvanic apparatus. Reaction times were measured by Hipp's chronoscope, the changes of the electrical resistance in the hand during the reaction being registered on photographic paper. A second and a half before the cards were exposed, the experimenter gave a warning signal. *The observers were instructed to complete each part-sentence as quickly as possible by an adjective or other word having the value of an adjective.* They were allowed to complete the sentence mentally if they could not find a verbal expression for completion. They were instructed to release a key thus breaking the circuit and stopping the clock at the moment of completion. After each reaction their introspection was at once dictated. The observers were given 20 sittings, seven "completions" being taken at each sitting, which lasted about three quarters of an hour. Every observer thus made in all 140 "completions"; the number of the protocols totaling in all 700 with as many photographic records and reaction times. There are, unfortunately, not many deflections on the photographic records for two observers (B. and C.) owing to their frequent high resistance,

so that the experimenter has thought better to take them separately into account. They will be, however, compared with the results obtained from the photographs for the other three observers (see pp. 134, 135 and 136).

No apparatus was used during the learning period. During the second part of the experiments an ordinary exposure box for stimuli (part-sentences), Hipp's chronoscope and the psycho-galvanometric apparatus were used. The exposure box standing on a table was placed in one room in front of the observer who was comfortably seated with his left arm resting on a support. The electrodes were attached to the palmar and dorsal surfaces of his hand. The experimenter operated both the circuits of the galvanometer and Hipp's chronoscope in another room, from which also he manipulated both the signal and the opening of the shutter in the exposure box.

The changes of the electrical resistance of the observers were recorded by a mirror galvanometer, with an external current of about 3.5 volts. The sensibility of the galvanometer was 330 mm. per micro-ampere when scale was one metre distant, the period of deflections being from 4 to 5 seconds. The Wheatstone bridge was used, the observer's hand forming the resistance of one arm of the bridge. Two arms had fixed resistances: one of 1000 and another of 10,000 ohms. The fourth arm was a resistance which could be varied between 0 and 200,000 ohms by 1000 ohms differences. In order to obtain measurable changes in the observer's hand while he was performing the task, different amounts of the current were shunted through the coil of the galvanometer. The amount depended on the sensibility of the observer at the time. In most cases one-fifth or one-tenth of the current was used; sometimes half and very rarely one-twentieth of the current was necessary.

The electrodes were made of brass 19 mm. in diameter covered with chamois leather. Before each sitting they were well soaked with physiological salt solution, the observer's hands having previously been washed in warm water with soap, and then attached to the palmar and dorsal surfaces of the left hand. The observer's arm was resting on a support while the hand with the electrodes and a rubber sponge underneath was strapped to the same support.

Details of the photographic recording were as follows:

The beam of light reflected from the galvanometric mirror swings to and fro along the slit in the recording instrument, while the photographic paper was passed behind the slit at right angles to the

direction of motion of the beam. The paper was driven by clock-work. At the same time flashes of another light, made by electrical contacts in a metronome marked the margin of the paper at intervals of one second.

The observers who took part in these experiments were F. Aveling, M.C., Ph.D., D.Sc., D.D., Rev. R. C. McCarthy, M.A., Ph.D., Miss H. Wells, Ph.D., Mr J. A. Taylor, and the experimenter himself.

We wish to express our gratitude to all our observers, but we feel particularly indebted to Dr Aveling for his constant advice and help in this work. We also thank specially Mr Taylor for acting as experimenter, whenever the experimenter himself was engaged as an observer, and for giving a helping hand on many occasions in operating the apparatus.

The research was carried out in the Psychological Department of the University of London, King's College, during the last term of the session 1923-24 and throughout the sessions 1924-26.

PART I

LEARNING THE MATERIAL.

IN following the different stages through which the pictures acquired their meanings, until these reached the final stage of an abstract and general concept, definite steps may be traced. This does not mean that all the observers passed through all these stages; nor does it mean that one observer followed the same steps in regard to all the sets of pictures. Varying degrees of difficulty in abstracting and generalising were already foreseen and intended in preparing the different picture sets. Individual differences formed another varying factor. Some observers reached a general meaning for a particular set with great difficulty. One observer could hardly ever pass beyond the individual meanings; he attained the stage of a fixed general concept practically only in one set, which was the easiest of all. While this observer in the other six sets remained at the same stage throughout all his learning and never reached the final stage, some observers, for some particular sets, came to the last stage without having passed through all the intermediary ones. On the other hand, different stages did not succeed each other in the same ascending order of abstraction for all the sets. Nevertheless, steps can be definitely noted and separated during the learning period in the case of all the sets and for all the observers. For the sake of classification these stages of abstraction will be given names, which will be used to denote the functional character of the different processes involved at the different stages of learning, and not the processes themselves. The latter are regarded, at least in their cognitional aspect, as being governed by Spearman's ultimate noegenetic and anoegenetic principles¹ for which we have found ample application all through our work.

INTERPRETATION OF INDIVIDUAL PICTURES.

- (1) *Forming of Associations*; (2) *Educing by Analogy*;
(3) *Plan*; (4) *Scheme*.

We shall use the name "Interpretation" to denote the first stage in the development of meanings for our material. This stage embraces the learning of the first members of all the sets. Interpretation

¹ Spearman, C., *The Nature of 'Intelligence' and the Principles of Cognition*, London, 1923.

was the predominant feature of the first acquisition of meaning in the case of the first individual pictures. So far as the individual meanings in general are concerned, however, it sometimes went beyond the range of the first members of the sets and continued during the learning of the second, or even third, fourth, etc., member. For example, the observers tended often to fall back upon a spontaneous interpretation of a picture if this stood apart from the group with some striking feature of its own, no matter how far the learning of the whole set had advanced, or whether the main character of the group was already established or not. But this happened, in most cases, only at the first presentation of a new member bearing such striking individual qualities. It was abandoned as soon as the relation to the group character was cognised; and reappeared from time to time spontaneously in the guise of an association.

Although our pictures may be called "meaningless," they were not, strictly speaking, without any meaning. They were meaningless only to the extent that the experimenter did not intend to suggest by the particular pictures used any particular and definite thing. If any one of the pictures was taken out of its group, it could not mean anything definite, although, of course, they all must have meant something (at least a coloured shape). Their adequate meaning could only appear in their interrelations. Often it was not enough to grasp the relation between two pictures only in order to obtain an adequate meaning. The third member of the group might not bear the same relation as that deduced between the first two, or the following three members might form a group for themselves according to their interrelations. Thus, that a determinate and univocal meaning for an individual picture and a general meaning for the group should be acquired, each individual member had to be related to the group as a whole. Therefore "meaningless" means here that a picture, when exhibited for the first time and without knowledge of the following members of the same group, might be given different meanings according to the different ways in which it might be related to past experience of the observer; and when it had been given one such it might undergo some further changes in the course of learning the following pictures. What meaning a picture would obtain at the beginning of our experiments, appeared to depend on the individual differences of the observers, on their past experiences, on spontaneous arousal of associates (and, of course, on relations and parts constituting the picture) etc. The name "Interpretation" may thus serve to

designate this first stage; in which different pictures acquired their meanings regardless of the final meaning which they might acquire later on.

By pronouncing the word aloud and looking attentively at the pictures during their first learning, the observers tried to form associations between the two. This could not be done by mere brute force of repeating the nonsense names without seeing any meaning in the pictures. (We did not ask our observers to furnish introspections of the processes occurring while they were learning, but from the introspections taken during the period while their reaction times for meaning were taken—when they tried to revive what they had learned—and from their drawings, we can infer how the pictures were interpreted during the first stage of learning.) It has been shown in previous experimental work by F. C. Bartlett¹ that the observers always try to find a meaning when the material (geometrical figures, pictures, ink-bLOTS) is presented; and that perception without meaning is impossible. Also in T. V. Moore's work on *The Process of Abstraction*² we find the author able to state that "Perception is a process of assimilating the data of sense experience to their appropriate mental categories." According to this author, "it is a fact that a complex of sensations on being received into the mind is interpreted" and "the interpretation takes place by means of the something that we may term 'mental categories' to which the sensation is assimilated."³ Without going into an analysis as to what these "mental categories" are from the phenomenological point of view, we shall exemplify a few cases of *interpretation* occurring in the beginning of the learning and try to point out the differences between them.

BOGIL (picture), e.g. after the first learning already meant for some observers "small blue flower-like figure." First MEVOZ was for one observer "head of a mule in a boot"; for another, "animal's head"; still another, "a figure like a bear"; for one observer it was "amoeba-like figure." First SABOM was interpreted as "hare-like," "rabbit-like" and "root-like" figure. Further examples may show still better how the same pictures were differently interpreted by different observers. First PETUL was for two observers "flower"; for one, "mouth

¹ Bartlett, F. C., "An Exp. Study of Some Problems of Perceiving and Imaging," *Brit. Journ. of Psychol.* VII, 1916.

² University of California Publications, 1910. Cf. also Aveling, F., "The Relation of Thought-Process and Percept in Perception," *Brit. Journ. of Psychol.* IV, 1911.

³ Moore, T. V., *The Process of Abstraction*, p. 183.

of snap-dragon flower"; and for still another, "like the map of India." First DIPUV was "bird on a branch." In the case of the last member of the MEVOZ group—although all previous members of the same group had been learned—the meaning was, in the first learning for one observer, "man's face with a beard," and for another a "clay-pipe."

Some observers found it very difficult to associate words with the pictures even if the latter were not quite meaningless. One observer, who is not a visualiser, set himself the task to form some relation between the words and the pictures. He succeeded sometimes in relating the two by mnemonic means. So he formed, for example, the associations: MEVOZ—ME—MOE—AMOEBA. Another observer formed the association between DIPUV and its corresponding picture: "to dip with" (like something to dip with). Another example for the association between the name and picture is: LUMIG—GLUMIG—TWO ENDS THE SAME. Still another example for one observer is: BOGIL—BO—BEAU—BEAUTIFUL—PRETTY BLUE FIGURE. In most cases the mnemonic means was only a temporary intermediate link which was soon dropped, while the character "amoeba-like" or "two ends the same" e.g. remained fixed.

We can see now from the examples quoted how the pictures first acquired their meanings. "Rabbit-like," "flower-like," "like animal's head," "bird on a branch" and similar examples, show how the meanings were expressed by the observers, but at the same time they show the nature of these meanings and how these meanings were acquired. They were all determined by the associates that arose when the pictures were first learned. And that they were dominated by those associates is evident from the fact that the same pictures, in many cases, were differently interpreted by different observers. But the mere verbal expressions of the meanings, if nothing else, suggest something more than pure and mechanical arising of the associates. The pictures were *likened to* something that was revived during the learning from the past experience of the observers. So the finding of the meaning in a picture during its first learning consisted, at least partially, in educing a correlate by analogy on the ground of Spearman's third noegenetic principle¹. When the observer reacted to the exposed word with the meaning, e.g. "rabbit-like" or "flower-like" or with any other meaning, he had then again associative reproduction plus eduction of the correlate. (The observer must have had the chain, e.g. SABOM—RABBIT—plus eduction of

¹ *The Nature of 'Intelligence'*, pp. 91 and 246.

the figure by analogy.) Reproductive processes have been involved also before the observer could find any meaning in the picture while he was regarding it during the learning. That both associative and educative processes are involved in the perception of an object has again been clearly shown by Spearman in his example of a match box¹. In the case of those pictures of ours which were spontaneously interpreted in the first learning, the reproduced associates were more dominating and the constitutive whole of the shape less determinant of the meaning of the picture than would be the case in the perception of a match box². The character of the picture which was thus educed was not intrinsic to the picture. If it were intrinsic there would probably be no more than one possible interpretation of it. But that character was "tied" to some concrete past experience of the observer rather than belonging to the "constitutive whole"³ of the picture itself, and instead of being dominated by that whole the "whole" was dominated by it. The extreme opposite of this kind of education is the case in which associates determine the meaning to a very small degree, or to none. The relation or system of relations was cognised and the "constitutive whole" of the picture was thus educed. This occurred in all those cases where the grasping of a scheme, system or plan was reported. Such a case is illustrated in the following protocol.

"Recognised PIMEF as the first presented to-day. Knowledge with kinaesthetic feeling that there were three peaks on the left and one or two on the right. This knowledge was not very specific. I think I could draw a schematic picture representing the class of which this individual was one (might be one)." Observer E., PIMEF, R.T. 2.8 sec., second learning of the first member of the PIMEF group.

Drawing of the picture in the same session is shown in the Fig. I, *b*.



Fig. I. *a*, Outline of the original picture. *b*, Drawing of it by observer E.

¹ *The Nature of 'Intelligence,'* p. 246.

² It would be much more like the interpretation of "ink-blot."

³ This term is used to denote the "shape" of a picture as an educed relation or system of relations (Spearman) and at the same time to mean a "whole" in the sense of Gestalt-psychology (cf. "shape," "configuration," "structure" and the like).

Another example, in which the relations constituting the shape of the picture were grasped, may be shown from another protocol taken after the first learning of the first member (first sitting with that observer) in relation to LUMIG. The report is as follows:

"Remembered that in learning I had said 'GLUMIG' and that there was something in the picture like this: that beginning and end, right and left, repeated *the same motif*, but could not recall a definite picture." Observer E., LUMIG, R.T. 13 sec., first session.

Here the mnemonics helped the revival of what had been educed in learning, although this was not definite enough to educe and reproduce details during the reaction time. It could not be said that in learning this picture reproductive means were dominant in determining the constitutive whole of the picture, as they were in those pictures which were freely interpreted. Mnemonics were a device of the observer to retain what must have been educed already. But that the device did not influence the education at all in the case of this observer can be seen from the fact that most observers had more or less the same meaning for LUMIG at the very beginning ("both ends similar," "two ends alike," etc.). The use of mnemonics might have influenced the educing of the meaning of the MEVOZ picture ("amoeba-like") by one observer (MEVOZ—ME—MOE—AMOEBEA). But this case may be classified together with all those cases which we call "freely interpreted," in which associates dominated the meaning. But even in the case of the first MEVOZ picture the important thing was association between the picture and the past experience—not the mnemonic link between the word and the picture. This link soon ceased to be necessary, while the former association reappeared from time to time.

From the data so far considered it can be seen that there were different kinds of interpretations of the pictures when they were first learned. In all of them Spearman's education principles, together with reproduction, are implied. But whereas associative reproduction was most strong in determining the meaning of those pictures which we have designated as "freely interpreted," it was weakest in the educing of the meanings where the character of the constitutive whole of the picture itself predominated. We have said that in the first case the character was extrinsic to the constitution of the picture and belonged to the concrete past experiences of the observer. The result of this difference was that in the beginning of the learning the meanings of the "freely interpreted" pictures were more determinate with regard

to their details than the meanings of the pictures in the eduction of which associations played the least or no part at all. The drawing of PIMEF shown above (Fig. I) gives only a PIMEF picture. In the protocol quoted on p. 15 the meaning of LUMIG is still less determinate: the observer knows the main constitutive characters of the picture but he cannot draw it. Whereas the drawing in Fig. II, *b* shows all the details in full determinateness.

All the drawings of "freely interpreted" pictures exhibit more or less full determinateness in the execution of the details of the pictures. Here we have what Koffka¹ calls "structuration" process. While the "structuration" will be shown later on to be a general feature of the steady growth of knowledge for most pictures (Spearman's

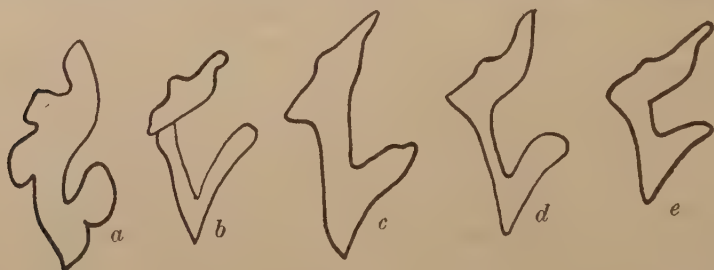


Fig. II. *a*, Outline of the first DIPUV. *b*, The picture drawn by observer C. after the third learning; *c*, drawn after the fourth learning and after all the members of the set had been learned; *d*, after the fifth learning; *e*, after several repeated learnings (33rd session).

growth of determinateness, differentiation) with its opposite process of simplification (Koffka), convergence (Müller) or confusion (Spearman)—it occurs too early and too "one-sidedly" in the cases where there was "free interpreting" (because of the confluence of the first interpretation). This too early, but one-sided, "structuration," as we shall see later on, will tend to prevent slow change and growth of the main characters pertaining to the whole group of pictures, and thus will not be favourable to the formation of abstract concepts. It will be favourable to the meanings of the individual pictures by fixing them. But on the other hand, and from another point of view, it tends to handicap the development of the correct meaning even of the individual pictures themselves on the following grounds. We have already mentioned that the characters of an early and "freely interpreted" picture are dominated by the associations with some

¹ Koffka, K., "Introspection and the Method of Psychology," *Brit. Journ. of Psychol.* xv, 1924, p. 157.

concrete past experience. We said that the educed character is not "tied" to the constitutive whole of the picture as much as it is "tied" to the associated concrete idea. This means again an "over-structuration" of the whole, which may lose its constitutional balance and thus be falsified. This may be seen in drawings of our one observer who had the tendency to interpret too much and too freely. In Fig. II a series of his drawings shows how even an individual picture was seriously affected by this early over-structuration (under confluence of the first interpretation: "bird on a branch"); the result being that there was no change in determinateness of the picture, no matter how many times he learned it.

At the opposite extreme, with regard to the determinateness of a meaning, was the case e.g. shown in the protocol on p. 15. A more determinate meaning but not as determinate as those of "freely interpreted" pictures, was shown in the protocol for PIMEF on p. 14 with drawing in Fig. I. In the case illustrated (which represents many others of the same kind) the characters were educed without any "free interpretation"; (although with some interpretation) they were cognised as belonging constitutively to the structure of the picture. Although not so determinate, the character of the LUMIG picture (quoted in the protocol) shows also the grasping of relations already in the first learning. The difference between the last two examples and those of the freely interpreted pictures is a general difference between two types of obtaining the first meanings for all the pictures. The grasping of what is constitutive to a picture (finding out relations or a system of relations in it) although it does not serve well the individual meanings at the very beginning, allows for slow growth of its determinateness and thus helps the formation of an individual meaning which will later on be relevant to the general meaning of the whole group. At the same time this serves as an undeveloped *nucleus* which will grow up into the concept of the group as a whole.

How early such a nucleus begins to emerge may be seen from the last sentence of the quoted protocol on p. 14 in which the observer reports: "I think I could draw a *schematic picture representing the class of which this individual was one.*" Not only has the observer grasped what is constitutive to the whole of the picture in a scheme, but he is explicitly conscious that this scheme may represent some whole class. This scheme becomes thus explicitly anticipatory. We shall see how the consciousness of the possibility of a scheme to

represent the whole class will be very significant for abstraction and generalisation in the later stages of learning. It is worth while to stress the fact that such a scheme educed from a single picture, while yet the other pictures of the set have not been learned, occurs only with some observers in the learning only of some sets. This does not mean that such a scheme need remain fixed (the very fact that it is only an indeterminate scheme rather suggests that it will undergo some changes in its growth). It may be abandoned as soon as the learning of the new members of the same set bring forward new characters which would better express the constitutional whole of the group. The previously acquired characters will then remain to constitute only the individual wholes; while a new relational scheme will be substituted for the old one.

INTEGRATION AND DISINTEGRATION OF MENTAL PRODUCTS.

Adaptation of the Observers to New Material and Readjustment of the previously acquired Characters from Old Material.

We have seen how the first members of the picture groups were interpreted at the beginning of the learning period. Their meanings were obtained either by analogy with some concrete content of past experience or by eduction of the (relational) constitutive whole of the picture. This latter process was also often connected with some abstract concept of past experience. The reproduced concrete contents being themselves more determinate (in the sense of their concreteness) when associated with cognised pictures, tended to lend their own characters to the pictures and thus to determine their meanings (by confluence) in a rather one-sided and restricted sense.

The characters of these pictures—which we have called “freely interpreted”—were related to the associated concrete contents rather than to their own constitutional whole (configuration). Where the associated contents of past experience were more abstract and less determinate (in the sense of their generality), the educed meanings were of a broader character and not over-determined as were the “freely interpreted” pictures. There was therefore greater scope for such pictures to grow in meaning gradually than for their future development to be predetermined in one direction. When an observer saw in the first picture a “bird on a branch” and the meaning of the picture subsequently became for him a figure like a “bird on a branch,” it is difficult to suppose that the next member of the group

would suggest the same idea. By pure chance one part of the first picture suggested a bird and another a branch when it was learned. Since the individual pictures varied in their details rather than in their essential characters, and since it was the details of the first picture which suggested the above meaning, one might expect that the next member of the group, with its new details, would suggest quite a new meaning. And that is exactly what happened with one of our observers in several sets of the pictures. We have already mentioned that it was difficult for this observer to form an abstract concept of any one whole set; and we have also seen how even his meanings for some individual pictures were affected by over-stressing some of their peculiar characters at the expense of those which were essential to the constitutive whole of the pictures. Further, we have mentioned that for some other observers also interpretation tended to reappear whenever a new picture was presented with its individual details too greatly accented—thus tending to split up the constitutional whole of the group. But as soon as these observers had grasped the common character appearing also in that individual picture, free interpretation was checked.

This checking of "free interpretation" for all the observers but one (observer C.), began as soon as the second members of the sets were exhibited for learning. The pictures were then interpreted either under the aspect of the preceding member of the same group or on the ground of their own intrinsic characters. If a picture, after three consecutive learnings, had developed a character, this became strengthened when it was discovered also in the second member of the same group. But this character might not have been essential to the "constitutive whole" of the first picture, as often happened in the case of the "freely interpreted" pictures. In the SABOM set, for example, the first picture on its first presentation was interpreted by most observers in much the same way. The upper part was described by them to be like the "ears of a hare," like a "rabbit," or some other "animal." But in the subsequent presentations of the same picture, before any other picture of the group had been presented, their knowledge became more determinate; and there were several corrections and completions in most cases. There was one observer especially (observer B.) who otherwise attained the stage of general meaning in all the other sets, but could not achieve it in the SABOM set at all. Further, this observer could not draw one single picture of the set in question except the first, and that

picture was always interpreted by him on the ground of the original association made when it was first learned: SABOM—SAB—RAB—RABBIT. The picture became determinate from the very beginning: its upper part meant the "ears," its lower part the "tail of the rabbit." There was nothing added to that knowledge in any of the subsequent presentations of the same picture. The observer reports in the third learning, for example, as follows:

"The meaning came through 'rab-rabbit.' That came first. After that a visual image came, clear in colour and shape. (No addition from yesterday.)" SABOM, R.T. 3.4 sec., third session.

In the following session, after the second member of the same set had been learned, the observer reported as follows:

"I pronounced the word in inner speech, and with more or less complete verbal imagery the thought 'this is my rabbit' came. There was a knowledge of the judgment I had pronounced on learning the second SABOM, i.e. 'colour the same and part of figure the same' (the rounded projection at the bottom of the figure representing the 'tail' of the first SABOM). There were fragments of imagery. The only definite words I could hear were 'colour and tail,' kinaesthetically very clear." SABOM, R.T. 1.6 sec., fourth session.

In the following learning session the same (second) picture was reported to mean "brownish grey figure with 'tail-like' projection pointing downwards." There was again with the visual image, a fragmentary verbal image "rabbit." In the sixth session, after the third member of the same group had been learned, the observer reports as follows:

"I recognised the word SABOM. I could get no general meaning to it at all. The only meaning I had, when I reacted, was a red image rather vague in shape of to-day's SABOM. There was a knowledge, too, that I was then (*when learning*) *unable to find* any resemblance between to-day's SABOM and the other two. So I reacted on to-day's individual meaning."

In further learning of the same figure again the observer could not find any resemblance in the pictures, and stated that they all seem to be different. And similarly in the learning of the remaining members of the SABOM set the observer either does not find any similarity, or if he does find any, this refers to the "ears" and "tails" projections. But both these projections remain "loose" from the rest of the picture and often do not represent its actual parts at all. When we analyse the drawings of this observer for the SABOM set throughout the course of the learning period, we do not find one single drawing completely executed for the pictures numbered 2, 3, 4 and 5. Only the drawings representing the first picture, which

was interpreted as "rabbit," are complete. The parts of the later members, which were drawn, are designated by the observer as representing recognised "ears" and "tails"; but they do not actually represent them. In cognising the later pictures the observer always takes the projection at the bottom of the figure as "tail" and those of the upper part as "ears." In that way he is misled by the chance position of the picture to take different parts of it which are really irrelevant characters instead of finding out the homologous parts of the structure in their constitutive relation. The result is that this observer could not possibly unify them. They remained mere "and-connections"¹ instead of being integral parts of a constitutive whole.

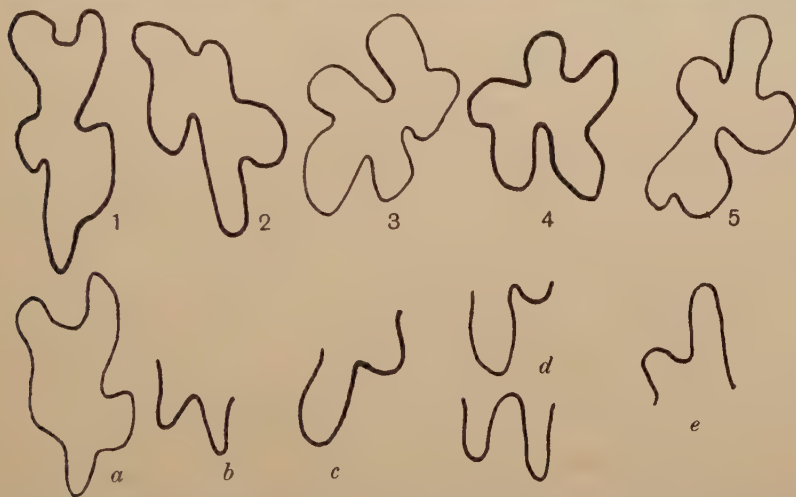


Fig. III. 1, 2, 3, 4 and 5 represent the pictures of the SABOM set; *a*, *b*, *c*, *d* and *e* are the drawings of the same pictures respectively made by observer B. after repeated learnings.

The further result was that the observer B. could not form any general meaning for this set of pictures at all; although he succeeded in achieving general meanings in almost all the other sets. From the accompanying drawings in Fig. III it may be seen that even individual meanings for other than the first picture could not be established by him.

It is instructive to compare with the foregoing the learning of the same set (SABOM) by observer E. He reports after the first learning that SABOM 1 is "rather like a hare"; and draws it as in Fig. IV,

¹ "The least degree of unification is a mere summative connection, a form of cohesion which may be called an and-connection."—Koffka, K., *op. cit.*, *Brit. Journ. of Psychol.* xv, 1924, p. 157.

No. 1. In the second session, after learning the same picture, his report is as follows:

"Recognised SABOM and remembered without imagery that it was *rather like 'root'* with two protruding humps, one on each side of it. Reacted with conviction." SABOM, R.T. 1.6 sec., second session, drawing No. 2 in Fig. IV.

In the third session, this knowledge became more or less fixed. In the following session, in which the second member of the set was learned, the observer reported:

"Saw SABOM. Knew that it refers to two pictures and had auditory and kinaesthetic fragmentary images with knowledge that the first picture was like a 'rabbit' and *both like a 'root.'*" SABOM, R.T. 2 sec., fourth session, drawing No. 3 in Fig. IV.

After the second learning of the same picture (SABOM 2) the report is as follows:

"Saw SABOM. Knew it was like a 'root,' brownish, elongated, stumpy thing with two knobs one each-side. The left hand one higher than the other and indented." SABOM, R.T. 1.4 sec., fifth session, drawing No. 4 in Fig. IV.



Fig. IV. *a*, *b* and *c* represent the first, second and third pictures of the SABOM set; numbers 1 to 9 indicate the drawings of the respective pictures made by observer E.

After the third picture of the set had been learned the observer reported:

"Saw SABOM. Knew it was 'root-like' picture. *Thought of the second SABOM.* Knowledge that this one was *different*: smaller and bright red." SABOM, R.T. 1.4 sec., sixth session, drawing No. 7 in Fig. IV.

Drawing No. 8 in Fig. IV indicates the knowledge of the same picture SABOM 3 after it had been learned for the second time. Further progress in determination of the knowledge for this picture is indicated by the drawing No. 9 in Fig. IV. After the fourth member had been learned once, the report was as follows:

"I saw SABOM. Waited. Knew that I knew it and then, without any visual imagery or other imagery, knew that it was one of the *class like a 'rootlet'* with leaves beginning to sprout. Remembered that in learning I had thought this a very *bad likeness*, but *forced* the meaning into it. There was knowledge that it was green." SABOM, R.T. 1.4 sec., eighth session.

In the following learning of the same picture the observer fixed what had already been differentiated in the previous one. Similar progress in differentiating and fixing was made in the learning of the fifth member of the SABOM set.

If we compare both the drawings and the introspections of these two observers (B. and E.) for the SABOM set, the difference in their development of meaning for this set is striking. The difference is not so much due to one observer (E.) not being a visualiser and the other (B.) being of both the visual and verbal type. The failure of observer B. to form any knowledge of the general character for the SABOM set is principally due to his being unable to abandon the old interpretation originally made of the first SABOM, when he came to learn the second, third and other subsequent SABOM pictures. The main characters of the first member were fixed for him under the influence of the first association; and no further characters of the picture were acquired even after repeated learnings of it. Observer E. also interpreted the first SABOM in his first learning as a "hare-like" figure; but in repeated learnings of the same picture his knowledge of it acquired new determinations ("root-like"). So when the new picture (SABOM 2) of the same set was learned, and the knowledge of the first member was already sufficiently differentiated, there was something in that knowledge to select from in order to adjust the characters of the second member to those of the first. "Root-like" was already differentiated in the later learning of the first picture, although it was then only an "accidental character"; now it was

referred to the second member as well and was already becoming an "essential character." In Protocol 24 the observer explicitly reports:

"Knowledge that the first picture was like a rabbit and *both like a root.*"

In further learnings of the same picture still new characters were added, but the character, "root-like" now old, became fixed. In still further learnings of the subsequent members of the same set the development of knowledge follows the same lines; the old character, if it was found in a new member, became fixed, while new differential characters were also developing after each learning of every individual picture. If the old character was not found in a subsequent member it was considered as belonging only to the preceding one.

Reviewing again the development of characters in the SABOM series for observer E., we see that "hare-like" was at first an essential character of the first picture; later on "root-like" became differentiated as another character of the same picture. "Root-like" was found also in the second member of the set, whereupon "hare-like" was referred now only to the first member. In the third SABOM "root-like" was recognised again; and it was finally fixed as an "essential character." When the fourth member was learned, and the observer found that this was not quite like the other pictures of the set—in the sense of being also "root-like"—that individual picture did not obtain any new character of its own, but was simply forced into agreement with the one already fixed. The picture was differentiated as individual by its degree of likeness with regard to the "essential character" already established (as well as by several non-essential individual features of its own). The character "root-like" was *not* now exchanged for some new character as was done with the character "hare-like" in passing from the first to the second member of the set.

The fifth SABOM was also determined negatively by its being recognised as unlike the others.

"Knowledge that this SABOM (fifth) was the 'rootlet *without the root.*' No colour, no images." Observer E., SABOM, R.T. 1 sec., tenth session.

"Saw SABOM and knew that it was *unlike* the others with regard to part of the character, which gave me a meaning. No colour, no image. Confident that I could draw it fairly well." Observer E., SABOM, R.T. 1.2 sec., eleventh session.

We shall see later how the determining of an individual picture in this way (*by its negative character related to the whole set*) was

important both for abstraction and generalisation in the learning of our material.

From the examples so far given it is evident that a character, which was taken to be "essential" in determining the meaning of a previous picture, is likely to be relinquished as such, to give place to some other character, as soon as it has not been found to be "essential" in a subsequent member of the same set. From the last-quoted examples it may be surmised that there is a sort of economical principle involved in this changing of characters. For a time an adapting of characters may take place; then any such change comes to an end and the character is finally fixed, the new members, if they do not possess this character, are related to some already established essential one. In this way the change does not go on continually. An exception to this ("saving") method is the manner in which observer C., as already mentioned, learns the pictures. Every new picture in this case acquires its characters independently from those which have developed already for other members of the same set. We have seen that C. was apt to interpret every picture "freely" and that he was not successful in forming general meanings for most of the sets.

So far we have only examined the evidence derived from the learning period of one set of pictures in this respect. But a few examples may be cited further to illustrate the adaptation of the observers to new members of the same sets and the readjustment of their meanings during the course of learning. We shall now compare the developments of the meanings for the PETUL series with the observers A., B. and E. At the outset all three observers had the same association PETUL—PETAL in learning this set. Observer E. recalls this association after the first learning and gives the drawing of the picture as represented in Fig. V, No. 1. Observer A. had the same association and reported in the first session: "I remembered that its figure was shaped like a flower." He gave the drawing of the picture as in Fig. V, No. 2, which distinctly shows a confluence of this "flower" interpretation. Observer B. also reports as follows:

"The association PETUL—PETAL came. Then a knowledge that I had made association for myself when learning and had said to myself then: 'PETUL is like a snap-dragon flower.' Immediately on getting that knowledge with its accompanying verbal imagery, I had a clear visual imagery of PETUL." R.T. 4 sec., second session.

In Fig. V, No. 3, is the drawing of the picture for that observer.

Observer E. shows regularly a progress from less determinate to a more determinate knowledge. He reports after the second learning of the same picture as follows:

"Recognised word with auditory—kinaesthetic sensations. Remembered that I had formed an association with the word PETUL and that the picture could be representative of a petal of a pink flower. I had kinaesthetic images of its shape and the knowledge that there were *several* 'sinuses' in the left top corner and that the right top corner could be taken to represent a badly drawn L." PETUL, R.T. 3.4 sec., second session.

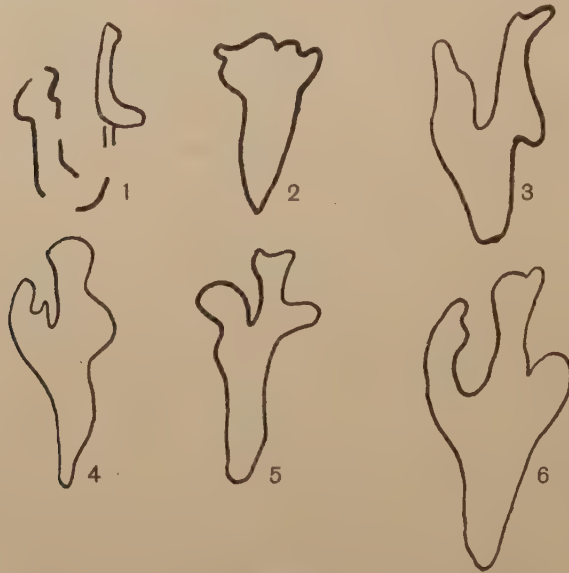


Fig. V.

The drawing of the picture is in Fig. V, No. 4. Observer A. similarly acquires more detailed knowledge of the picture and draws it after the second learning as in Fig. V, No. 5. Further development is shown in Fig. V, No. 6. Observer B. alone shows no further determination of the meaning, the drawing in Fig. V, No. 3, representing details which are not further differentiated no matter how many learnings of the same picture he had.

In order to show which of the characters already established for the meaning of the first PETUL will remain as the dominant character for a meaning of the subsequent members of the same set, it will be necessary to exhibit the drawings, made by the observers to represent what they knew about the pictures of this set, at different stages of their learning.

Observer E., among other characters reports in the protocol quoted above "several sinuses in the left top corner." After he had learned the second PETUL, he was able to draw only these "sinuses" with one corner of that picture (Fig. VI, No. 1). Later on, the same "sinuses" were to be recognised as common in all subsequent pictures of this set. This character always was the first to be drawn; and then after repeated learning the rest of the drawings were developed out of it as from a nucleus. The final drawings, which represent more or less correct reproductions of the original pictures are not shown in Fig. VI, but the drawings shown indicate how this knowledge advanced in its determination in the case of observer E.

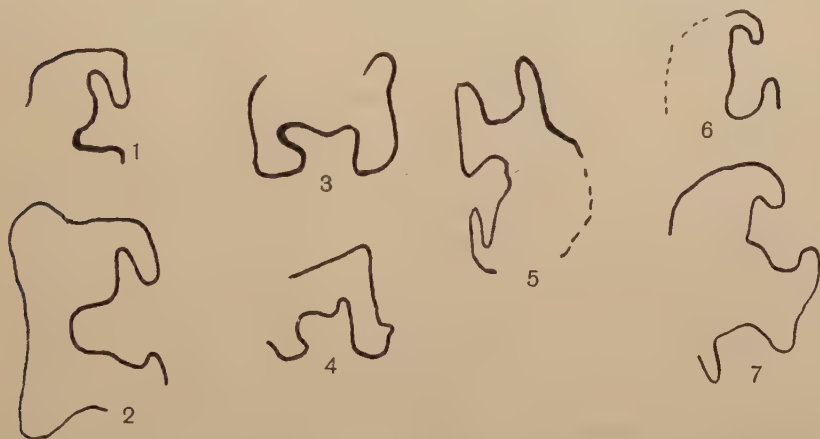


Fig. VI. Drawings made by observer E. at different stages of learning. 1 and 2 are drawings of the second PETUL, 3 and 4 of the third, 5 of the fourth, and 6 and 7 of the fifth PETUL. Nos. 1, 3, 5 and 6 represent the drawings made at an earlier stage.

Instead of giving the introspective records we shall show series of drawings representing the development of the meanings for the different pictures of the same set (PETUL) in the cases of the other two observers. The drawing, No. 6 in Fig. V, was made after the third learning of the first PETUL by observer A. The most determinate knowledge of the different pictures of the PETUL set for this observer refers to that common part which is *indented* and which was designated as the "sinus part" by observer E. This part also determines the drawing of the whole picture in the case of observer A. He reports that while learning the pictures, from the learning of the second PETUL onwards, this part appears to him outstanding as the

"white of the card" ("ground figure" of Koffka¹) and that this is the part which he can reproduce most easily in beginning the drawing of an individual picture. The same part appears as the most prominent part also in the introspections and drawings of observer B. While the first picture was "snap-dragon flower" recalled by association PETUL—PETAL, the second picture becomes also "snap-dragon flower," but the prominent part now is really "mouth of the snap-dragon"; and later on that character becomes fixed as "mouth of

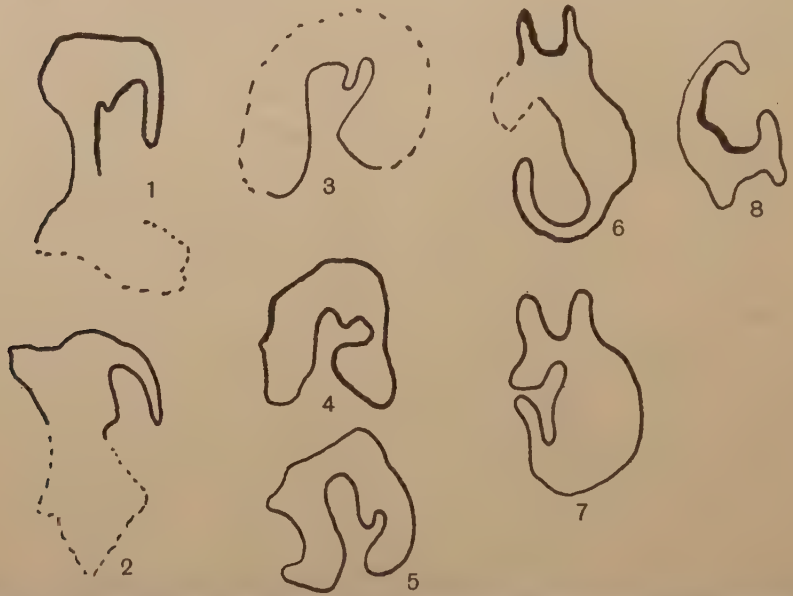


Fig. VII. Drawings made by observer A. 1, 2 represent the second; 3, 4, 5 the third. 6, 7 the fourth, and 8 the fifth picture of the PETUL set.

a flower." The differentiated individual meaning came to be determined for him by the position of that "mouth." The drawings (Fig. VIII) made by the same observer show that the "mouth" is the only part well known to him, while the rest of each individual picture is either more or less indeterminate, or quite simplified, so that, but for the *position* of that part, we should not be able to tell in the case of many of the drawings, which picture they represent.

We have shown the drawings and introspections for the SABOM and PETUL sets as examples of how our observers behaved in the

¹ Koffka, K., "Perception: An introduction to the Gestalt-Theorie," *Psychol. Bulletin*, XIX, 1922.

learning of a subsequent picture when they had started with "free interpretation" of the first one of a set. After the first picture had been "interpreted" for the first time, one character of it became outstanding and essential for the "structure" of the picture by way of analogy with some item of the observer's past experience.

In subsequent learning of the same picture its meaning usually acquired some new character which for the time being might be only

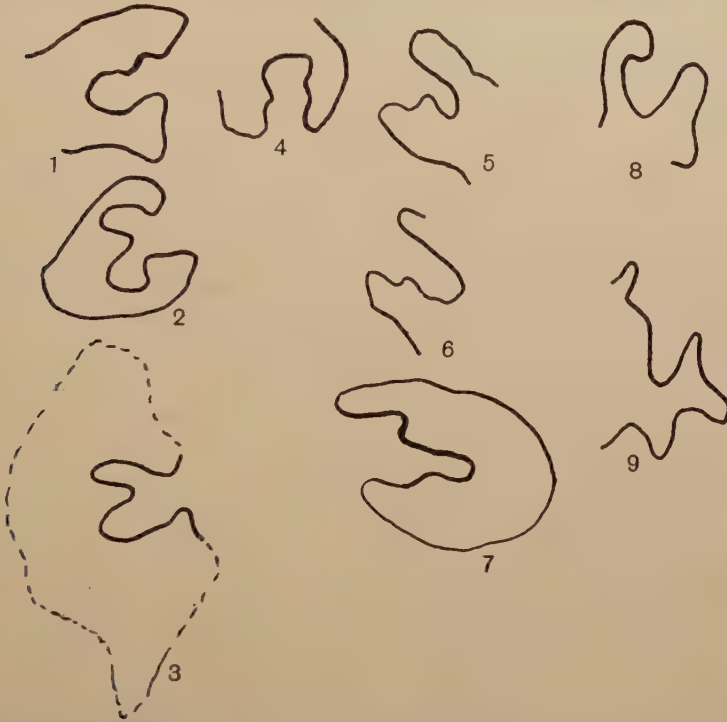


Fig. VIII. Drawings made by observer B. 1, 2, 3 correspond to the second PETUL, 4 to the third, 5, 6, 7 to the fourth, and 8, 9 to the fifth.

an accidental one representing some new detail. When the new pictures of the same set were learned, there was no new and independent interpretation of them, but an adapting of the observer's original meaning which had been acquired in the first "interpretation." At the time when the further pictures of a set were being exhibited there was an adjustment of the observer with regard to these characters which he now considered as "essential" and as "accidental." That this change of the observer's attitude with

regard to the selection of the characters was necessary for the formation of the general meaning of the set, is indirectly evident from the inability of observer B. to form any such meaning for the SABOMS. Also, that the standard for such selection consisted in the relations which constituted the "essential whole" of any set is evident from the failure of observer C. to form stable general meanings for any set except one. The change of attitude on the part of this observer went so far as to give a fresh interpretation to every individual picture of a set. In the one case there was defect in adaptation of attitude; in the other case excess.

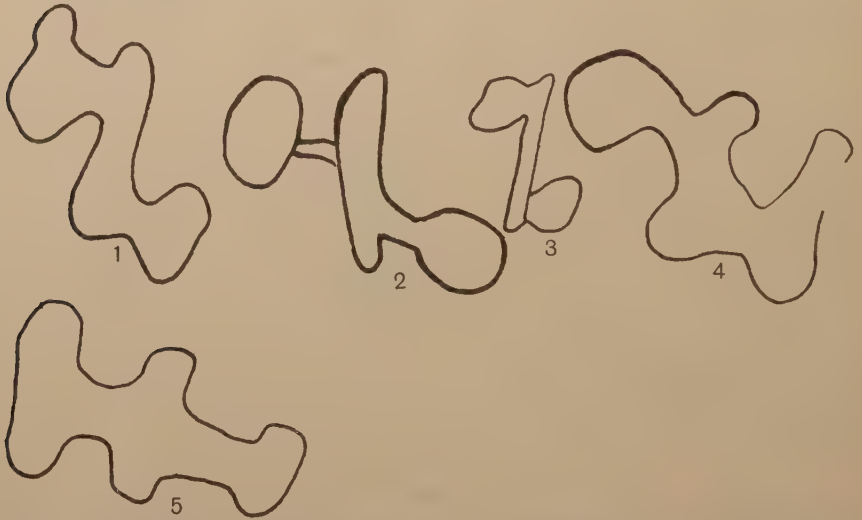


Fig. IX. No. 1 is the second PIMEF; 2, 3, 4 and 5 are drawings of it made by observers A., C., E. and D. respectively.

The way in which the observers adapted themselves in passing from the first to the second picture of a set was slightly different in the learning of those sets the first pictures of which were not "freely interpreted." In this case the "structure" of the picture was grasped on the ground of a cognising of some relations constitutive within it. If the second member of such a set represented a picture of a rather indefinite structure, more loosely displayed than the first one learned, the observer purposely employed some notional means (e.g. decomposition) in order to "structurate" it. For example, the first PIMEF had the character of a picture with three projections on one and two projections on the other side. The second PIMEF did not

represent these characters very clearly; and all the observers except B. made drawings of it which represented a more or less "analysed" and subsequently "structured" picture. See the drawings for observers A., C., D. and E. in Fig. IX.

Drawings No. 4 and No. 5 do not show by themselves that they were obtained by a process of "analysis" (or "decomposition") but the protocols of the respective observers indicate that this was so. Observer E. (who drew No. 4) reported in his introspection that "it was dirty green with a part something like a 'P' at the top left and another part something like 'V' at the bottom" (PIMEF 5, prot. 29). Observer D. (who drew No. 5) tried to place different parts symmetrically and was obliged to reproduce their interrelation before he could complete his drawing.

The passage from the learning of the first picture to that of the second picture of a set was marked by the use of similar notional means in those sets in which the first members were "interpreted," but the interpretation either did not offer much knowledge of the details of the picture, or the subsequent pictures were of a more regular design. An example of this is to be seen in the MEVOZ set, for most of our observers. The first picture of this set had an irregular outline, while the subsequent pictures of the same set had more definite, clear-cut, structure. The interpretations "bear's head," "mule's head in a boot" and other similar expressions for the first MEVOZ in subsequent pictures of the same set were substituted by "four projections on one and two projections on the other side" or by some other designation of the arrangement of the projections. Further determination of the knowledge for different pictures of the set consisted in relating the projections in question to the position of the picture, their size, the angles between them, their colour, and so on. The first picture of this set was interpreted by observer E. as "amoeba"; but in his case the character "amoeba-like" was not given up when subsequent pictures of the same set acquired their own individual meanings as well. This character was superimposed by him upon every individual meaning of the subsequent pictures of the MEVOZ set. The later individual pictures had characters of their own, but they preserved the general character of being more or less similar to an "amoeba-like" figure as well.

DIFFERENTIATION OF KNOWLEDGE.

Apart from the fact that the observers were changing their attitude and adapting themselves throughout the course of learning, in passing from one to another picture of the same set, the meaning of each as an individual tended to change also while it was repeatedly learned. New items as characters of the meaning for an individual picture and new relations to the whole of the set continued to emerge as learning advanced. We have seen already such cognitive growth indicated in the protocols quoted and drawings shown with regard to the adaptation of the observers mentioned above. The first PETUL was at the outset for observer E. only a figure "like a petal of a flower." In the second learning of the same picture, the knowledge of it embraced further items: "petal of a *pink* flower," which had "several sinuses in the left top corner," while "the right top corner could be taken to represent a badly drawn L." Similar development of meaning was shown with reference to the adaptation of the same observer in the SABOM set. The first SABOM was originally "hare-like"; and the observer could draw only the two projections on the upper part of the picture. Further learning brought forth the character "root-like," and some other details. The same growth of knowledge, in the course of repeated learning, occurs in the case of all the other individual pictures; one example being represented by drawings 3, 4, 5 and 6 in Fig. IV. The only case in which there was no slow growth of knowledge, but full determination of individual meanings from the beginning of the learning of each individual picture (with few exceptions) was that of observer C. (previously quoted with reference to "free interpretation" and early "over-structuration" of his meanings for different pictures)¹. Another exception occurred in the learning of the SABOM set by observer B., where the learning of the set came to an end with no determinate knowledge of the pictures at all (except the first) either individually or as a set.

From the examples already given it may be seen that the growth of knowledge in the learning of our material was effected in two ways: either (1) by a slow differentiation of new items in continuation with the old ones, or (2) by a rather sudden structuration. The latter was accomplished either (*a*) by analogy with some associated content of the past experience of the observer, or (*b*) by means of a purposeful

¹ Cf. the drawings in Fig. II, p. 16.

"decomposition" of the pictures and by a grasping of their constitutive relations. An important kind of differentiation is that in which a character continues to develop but always remains essential to the meaning of the whole set. Such a character (the same for four observers) developed and remained essential in all the pictures of the PETUL set, expressed by different observers as "sinus," "mouth," "opening or angles in the centre" and "indentation" respectively. What developed in the individual meanings was not, as a matter of fact, that character alone, but the other parts that were growing in relation to it as well. New items were continually developing out of it.

While in all growth of knowledge in respect of our pictures, some structuration was taking place, we have designated as "structuration proper" that kind of cognitive growth in which it does not occur slowly, and only after many repeated learnings. On the other hand, while all growth of knowledge consisted in differentiation, we have designated that kind as "differentiation proper" which grows slowly, spreading from one character, or one selection of characters, and continually embraces new ones. In the learning of a new picture of a set, both these kinds of differentiation bring new characters into the meaning; but at the same time they make the already acquired characters appear in a fresh light and a new relation to those of the whole set.

If we try to distinguish the growth of individual meanings from that of general meanings in our experiments it will be very difficult, if not impossible, to find any clear-cut boundary between them. The two growths are inextricably interwoven and superimposed one upon the other. Nevertheless it is a fact that differentiation serves better for the determination of the meanings of the individual pictures than for the generalisation of the essential characters of the sets. The latter can take place before all the individual pictures of a set have been learned: indeed the general meaning can be formed after only the second or third picture of the set has been seen without any knowledge of the further characters which might be necessary for the determination of subsequent pictures on the part of the observers. On the contrary, the meaning of an individual picture cannot be formed adequately without a fully determined knowledge of all its characters.

A fact may be stressed here with regard to the determination of an individual picture when visual images appear in connection with

it. It has been shown elsewhere¹ that "the 'individual' is phenomenologically present to consciousness as a concept in connection with sensorial contents (image)"; and our observers with one exception (a non-visualiser) tend to ascribe this "individuality"² to a meaning when they obtain a visual image, especially if a relevant image appears in consciousness prior to the appearance of the general meaning. The fact is that, in the case of our observers who are "visualisers," the visual images help them very little in determining their individual meanings. The images are for most of them signs that the meanings which arise are individual; but when they came to draw the respective individual pictures they did not rely upon the image but rather upon a knowledge of the structure and of the details of the picture in question³. In watching the observers while they were drawing the pictures, the experimenter often noticed that the execution of the drawing involved the whole series of eductions and reproductions of parts of the picture out of its relations (system, plan, symmetry, etc.). Knowledge of the number of projections, their relative size and position; the place of the picture in the set, the characters both of the preceding and the subsequent pictures, and the like, were employed. One observer, for example, described the image he had when he obtained the individual meaning for a picture as "a patch of green colour," and then he proceeded to draw the whole structure of the picture with all its details. But, on the other hand the same observer reported, e.g. the meaning of an individual picture because he had a coloured image of a particular one. He further explicitly stated that the image was clear and well defined—but when he came to draw the picture, his drawing represented a merely schematic shape, which could have been taken for any picture of the group. (In some cases the schematic image did not represent any particular picture of the set at all. It was a newly invented (educed) variety; and represented a "type picture" which might belong to the set. We shall have to return to this point later on, when we discuss the question of generalisation.)

We may compare the drawings of observer B. who reports "visual images" more frequently than the four others—A., C., D. and E.—with their drawings. Three of these observers are also visualisers;

¹ Aveling, F., *op. cit.* p. 242.

² Cf. *ibid.* p. 203: "that the meaning of the subject as 'individual' seems to have been automatically recognised upon, and essentially conditioned by, the emergence of an image."

³ Cf. the experiments of Ballard and Martin quoted by Spearman in *The Nature of Intelligence*, 1923, pp. 190-1.

but they rely in the learning of the pictures more on their notional knowledge than upon visual images themselves. The fourth observer E. is not a visualiser, though he often obtains kinaesthetic and auditory images. We can choose a set in which observer B. always reported visual images.

Drawings in Fig. X, numbered 1, 2 and 3, made by him represent the second PIMEF. He states that he drew that picture according to the image he had of it. In Fig. IX already shown on p. 30 are the drawings of the same picture made by the other four observers. When all the drawings of observer B. for the PIMEF set were analysed, it was seen that they represent very poor determinations of the particular pictures; whereas the other observers, who reported no images in their introspections before they made their drawings, and

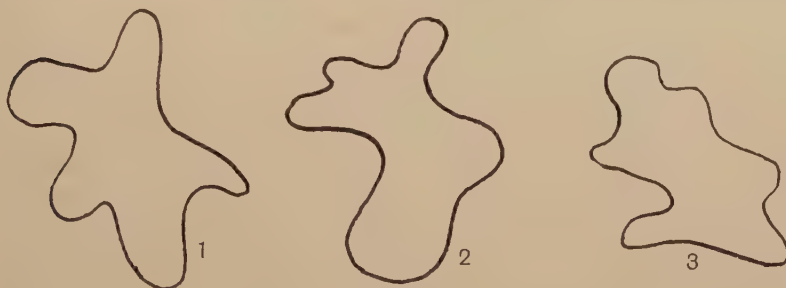


Fig. X.

who relied on notional means in reproducing and educing the characters of all the individual pictures more than observer B., were able to draw the respective pictures with comparatively more accuracy in the execution of both their details and their structure. (Cf. the drawings mentioned above, p. 30.)

Thus it may be said that images, no matter whether they were important or not in obtaining the meanings of the pictures in our experiments, did not help the *determination* of the meanings for individual pictures. *Notional knowledge alone is able to give full and definite determination of these individual meanings.*

There is another point to be discussed later on in connection with abstraction and generalisation which we wish to stress at present. It concerns what we might call the “*negative determination*” of an individual meaning. In the steady growth of knowledge (differentiation) continually new characters of individual members of a set are acquired, while the new pictures are being learned. Every new picture

of the set adds some new item to the knowledge of the characters of all the preceding pictures of the set. The continuous addition of these new characters tends to make them *diverge* and thus makes the integration of the general set-characters difficult. But newly learned "individuals" are not being determined only in an amplifying and thus "positive" manner¹. If, for example, the essential character of the set had been fairly fixed after the third picture had been learned, and if then the fourth picture offered some discrepancy in respect of the character which had been already fixed, the newly learned picture acquired its individual meaning by being determined "negatively." That is to say, it was related as dissimilar (or a "negative" variety) to the essential character already established as a class character.

In the previously quoted example of the SABOM set, the first picture was originally for observer E., a "hare-like figure," then "root-like." After the learning of the second SABOM "the first picture was like a 'rabbit'; and both like a 'root'." The third picture was "root-like" but "different." The fourth picture was "like a rootlet with leaves beginning to sprout," but there was also "thought that it was a very bad likeness, but forced..." The fifth SABOM was "the rootlet without root." Similarly in the LUMIG set, when the character "both ends the same" had been fixed, some of the subsequent pictures were determined by 'both ends not the same' or by some other relation of difference. These "negative" characters served well in determining the individual meanings without accumulating new characters, which might be useful for their individual determination but which would be cumbrous for building up the general character of the set.

REGRESSIVE CHANGES IN DETERMINATENESS OF KNOWLEDGE.

Simplification.

Up to the present we have been considering the growth of mental formations which are partly favourable and partly unfavourable to the formation of abstract concepts of the sets. Inasmuch as the relations between the pictures were emerging, and the characters constituting the "essential" whole of the group were being acquired, this growth was preparing the ground for abstraction; and in so far as the divergent individual characters were accumulating, this was

¹ Cf. this in connection with adaption of the observers to new material, p. 24.

unfavourable to the final formation of the common concept of all the pictures of the set. The general characteristics of the growth of knowledge for our pictures so far considered, consisted in its *progressive* changes.

The reverse—regressive—changes in knowledge, which was acquired in the course of the learning period, are decidedly favourable to the formation of the concept for the picture sets. We mean here the transformations in the direction of simplification and growing indeterminateness of mental products (Koffka and Spearman). Apart from the fact that individual pictures tend to be known after a certain lapse of time more schematically and without so many details as they had immediately after a number of repeated learnings, they are likely to be also mixed up with each other because the knowledge of them continually loses its determinateness (clearness) and continually new items, in competition with each other, are being acquired. We meet here the phenomenon which has been called by Spearman "confusion."¹ Falling back to a stage at which the differences cannot be distinguished follows also G. E. Müller's "principle of convergence."² But we must distinguish reversion to an indeterminateness of knowledge for the pictures (leading thus to their confusion) from *simplification* of the pictures previously known in all their details. If we correctly understand Spearman, he stresses this difference himself³.

With regard to our material, we take "simplification" to be a change opposite to the differentiation of an "individual" on the basis of its acquiring continually new characters after repeated learnings. "Simplification" thus means the falling out of some details of the picture after a certain lapse of time. It is important to notice that these details are not significant for the essential character of the individual picture in question and are still less significant for the "constitutive whole" of the set to which the picture belongs.

One point has already been stressed in connection with the question of "free interpretation," viz. that the knowledge of a picture, the structure of which has once been grasped by analogy with some item of past experience, does not tend to show any great change in the differentiation of its characters however the learning of the

¹ *Op. cit.* pp. 163-4.

² "Die Undeutlichkeit dient nach Massgabe ihres Grades dazu, die Unterschiede zu verwischen"—"Zur Analyse d. Gedächtnis," *Z. f. Ps. Ergänzungs.* VIII (1913), S. 509.

³ *Op. cit.* p. 164.

picture may be prolonged¹. The same holds good for such a picture with regard to reverse changes of knowledge, i.e. "simplification." Once "structured" by "free interpretation" a picture tends to preserve all its known characters. The reason is, we submit, that as long as the associated item of past experience, which has been used in the interpretation of the picture, can be revived, this serves to educe afresh the "structure" of the picture with all details by analogy. If the "structure" has been attained only by a slow progressive process, the picture may become, after a certain time, regressively "simplified." We have previously compared the drawings of the observers who relied upon notional knowledge, when they made them, with those of observer B., who relied upon his images; and we have seen how the latter were more simplified. We stressed then the fact that the full determination of an "individual" with all its details is possible only when there is notional knowledge to



Fig. XI.

"determine" it; we pointed out that the drawings executed according to the images obtained were all simplified and resembled each other.

We show a few drawings representing this slow regressive change of "simplification." For its easier comparison with growing "differentiation" we shall take the first picture of the BOGIL set which was the simplest picture of all the sets. The drawing in Fig. XI, No. 1, was made immediately after the first, No. 2 after the second, No. 3 after the third learning of this picture; No. 4 was made without any previous learning on that day; No. 5 was drawn after the fourth learning when observer E. was surprised (while learning it) that "BOGIL was not the same as the remembered first BOGIL." No. 6 was made (after an interval) without any previous learning, and No. 7 was drawn after the fifth learning of the same picture.

For the same observer E. the first SABOM became, after an interval of five months, as the drawing in Fig. XII. The drawing clearly represents a "constitutional" fusion of two main characters, i.e.

¹ Cf. drawings of the first DIPUV (interpreted as "bird on a branch") made by observer C., Fig. II, p. 16.

“hare” and “root.” The picture had been learned four times in the period of five months before the date when this drawing was made (cf. the drawing No. 2 of the same picture made by the same observer in that period, shown in reference to “adaptation” and differentiation in Fig. IV, No. 2, p. 22).

The drawings in Fig. XIII represent the picture of the first MEVOZ as known at different stages of the learning period. No. 1 was made after the third learning of this picture, No. 2 after the fourth; No. 3 was drawn after five months interval; No. 4 was drawn in the last (29th) learning session for this observer, in which the whole set of the MEVOZ pictures were exhibited and reaction to the meaning of this particular picture taken. All the drawings undoubtedly show confluence of the “amoeba” association; No. 3 moreover shows some confluence of the other pictures of the same set which were of a more regular shape but with angular projections; and which were learned some days before this drawing was actually made.



Fig. XII.

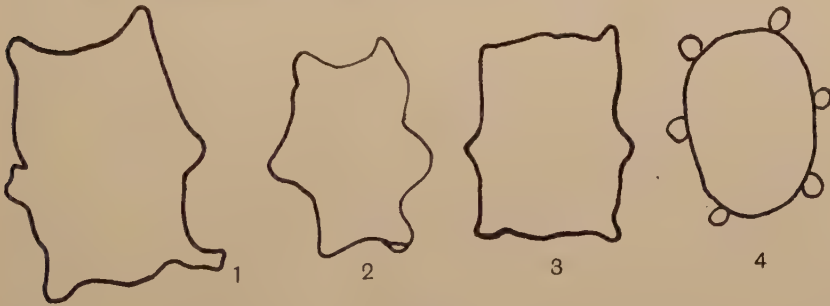


Fig. XIII.

That simplification is not the result of indeterminateness of knowledge (in the sense of unclearness) and thus equal to “confusion,” is indicated by the fact noticed when our observers drew the pictures, viz. that they simply could not draw the picture if their knowledge of it was not determinate (clear); or at least they could not draw that part of the picture which was not determinate enough to be brought into its “constitutive whole,” whereas a picture drawn as simplified does represent a whole figure, although all its “accidental” characters may not be included in it. This might explain why the

pictures which attained a well-defined "structure" did not suffer much change with regard to their subsequent simplification. At the same time this also explains why in the BOGIL set (all the pictures of which had simple "structures") there was exceptionally rare confusion between its members.

There is another point with regard to the simplification of our pictures. *When a picture has once become simplified, it does not tend to become still further so even after a relatively long time.* It may become indeterminate and then it cannot be drawn at all; but if it can be drawn without losing its "constitutive whole," it does not show any appreciable increase of simplification. The drawing of the first SABOM shown in Fig. XII represents that picture as known after five months interruption in learning the pictures. The drawing was made by observer E. on 21, XI, 1924. The learning period of



Fig. XIV.

that observer ended on 24, XII, 1924, but he could draw the same picture on 11, v, 1925 as shown in Fig. XIV, No. 1, which does not show any change in its further simplification. The observer did not once see the picture in question during the interval; although he twice made judgments upon it in the "completion" experiments. The drawings for the first BOGIL and the first MEVOZ in Fig. XIV, Nos. 2 and 3, do not show any further regressive change as compared with their corresponding drawings in Fig. XI, No. 6, and Fig. XIII, No. 4, respectively, although they were made five months later.

We said that simplification of the pictures does not lead to their confusion and we pointed out that the BOGIL pictures, which were originally of a simple structure, were rarely, if ever, confused. But the confusion did tend to occur more frequently in the sets with more complicated pictures, in which the "structure" was not clearly defined. And on the other hand these pictures did not tend to be

simplified although they had the tendency to become less determinate with lapse of time and under the influence of the other members of the same set. We have previously seen that the *knowledge of these pictures underwent progressive changes in differentiation only slowly. The regressive changes of the knowledge for these same pictures went through the same stages in losing determinateness.*

Although the simplified pictures were not confused, they did "converge" in that they became more similar than they were originally. Stripped of all their differing details their "constitutive wholes" became more prominent and thus prepared the way for abstraction of the "constitutive whole" of the set. By being simplified the drawings of any picture in a set come to represent any other. The only differentiating characters by which the "individuals" of the BOGIL set, for example, could be determined after this simplification were the colours and positions of the pictures.

Confusion.

Confusion has been taken by Spearman to be, among others, one way of forming concepts¹. In the course of the learning period confusion occurred sometimes with our observers, but not so frequently as one would expect. With some observers, however, it occurred more frequently than with others. It happened most frequently with observer A., who relied in recalling the pictures especially on his memory for colours. Except for confusion at the beginning of learning (the first and second learning of the first pictures), which consisted in "mixing-up" the pictures of different sets, and the confusion later on between the pictures of two different sets which happened to be learned together during the same sitting (which were numbered the same and were similar with regard to several characters²) we have not many cases recorded for other observers. Confusion between the PIMEF and PETUL pictures also tended to occur, doubtless because of the initial letters, with three observers (A., B. and C.). But this was only at the beginning of learning and never in the later learnings, in which the characters of the two sets were fairly fixed. Even this kind of confusion did not happen equally often with all the three observers mentioned above. It occurred most frequently with observer A. But this is not the kind of confusion that was meant in

¹ *The Nature of 'Intelligence,'* p. 268.

² For example MEVOZ 4 and SABOM 4.

Spearman's theory concerning the formation of concepts; for Spearman's "confusion" means *indeterminate*¹.

The most frequent confusion between the pictures of the same set occurred in the PETUL set, especially between the first and second PETULS. There was never confusion between the far simpler pictures of the BOGIL set. But on the whole confusion tended to occur more frequently in that period of later learning in which all the members of each set were being exhibited one after another (from 25th learning session onwards). Observer B. explicitly stated that he found the pictures more difficult to learn since the procedure of exhibiting all the pictures of a set together had begun. The essential characters of different sets had been fairly fixed before this confusion took place; and we do not find one single case of confusion of this kind in which the essential character was not clear (an exception again is A., who relied on his memory of colours). As a rule, two pictures at most of a set were confused; and that only in their details. The commonest case was the confusion of the first picture in the set (usually dominated by some strong association) and some other picture of the same set (generally that in which the essential character had been fixed). Such an example is the confusion between the first and second PETUL². All four observers, who were able to form the general concept for this set, experienced about the end of the learning period (once or twice) the confusion of these two pictures. It is interesting to note that the confusion in this case consisted almost invariably in combining the shape of the second picture with the colour of the first. And this can be explained. The first picture was first learned and had its individual meaning as a figure "like a *pink* flower," or "like a *pink* petal" or simply "flower-like" figure. When the second PETUL was learned, the observers had to change "flower-like" character for the characters "mouth of a flower," "sinus," and "indented figure," and the like respectively. This character developed further in the subsequent pictures, but the character "flower-like" remained strong also on the basis of its first association, although it was relegated to the first picture only. The meaning of the PETUL set when it was "confused" bore thus two characters: the pink colour of the first and the shape of the second PETUL, the sinus

¹ Thus "circle" denotes a concrete thing, with all its characters. All these, however, except circularity, are left indeterminate. "Circular," on the contrary, denotes only the determinate character.

² Here the determinate character carries the indeterminate also; and may end by carrying them all.

or "indentation" of the shape being the most prominent character of the meaning. This happened with most observers, who were explicitly conscious of the confusion. Observer E. also experienced once the confusion between these two pictures, but with the difference that the shape of the first picture was confused with the colour of the second. When we remember that he already began to differentiate the character "sinus," which was essential in the first picture of the PETUL set (while the others did so only in the second picture) we can understand this variation of the confusion. His report of this experience is as follows:

"PETUL meant a large scarlet figure shaped like the first one. This was all notional awareness. No images. I know that the first PETUL was not scarlet and here there was confusion, but the scarlet PETUL shaped like the first was intimately connected with a knowledge of the *sinus* which determines PETULS. This sinus was *prominent* in awareness and the knowledge was general." PETUL, R.T. 1.4 sec., twenty-second learning session, prot. 156.

Similarly, in most other cases, in which there was confusion, the essential character of the set was not "confused," it was quite clear and often very prominent in consciousness. The colours, among other details, were for our observers differential individual characters, and in most cases they were confused; both in the ordinary sense, and in that employed by Spearman.

While in some cases (especially those of observer A.) in which "many colours on the fringe of consciousness" were reported, we have undoubtedly again the confusion of differing and actually indeterminate characters; we cannot regard as "confusion" all those cases in which there was knowledge of the general shape-character of a set, but no consciousness of colour. This latter is quite an accomplished abstraction.

We were not able to find in the learning of our material any confusion of the kind reported by Spearman (except in the case of A., but here again confusion was always only an initial state of reproduction). "In truth," he says, "the imageless residuum, according to the observations of the present writer, instead of being only the feature common to every picture, was in some sort a temporary confusion of the entire different pictures including (though more faintly) their differing characters."¹ That in our experiments only the differing characters were confused rather than the entire pictures; and that what represented the common character of the pictures

¹ *Op. cit.* p. 270.

and thus constituted the essential character of the set, was always determinate in the case of a "confusion," may be demonstrated by all those drawings made by our observers, which show indeterminateness of differing features, but which are quite determinate with regard to that part which is common and essential to the whole set (cf. the drawings shown in Figs. VI, VII and VIII).

RETROACTIVE AND ANTICIPATORY INFLUENCE.

There are two further factors in the learning of our pictures which were significant for the "abstraction" of the essential character of the sets. One consisted in this—that the knowledge of the previously learned pictures was influenced by the learning of the subsequent pictures of the same set; the other was that the cognition of the subsequent pictures was influenced by the knowledge of the foregoing ones. One consisted in *retroactive*, another in *anticipatory* influence upon the growing knowledge of our pictures. The former is difficult to trace definitely throughout the learning of our material and to treat in separation from the effects that are due to quantitative factors of the mental processes involved in regressive changes of knowledge, which we have previously considered. The effects of lapse of time, e.g. seemed to be "pooled" with the confluence of different pictures one upon another. Nevertheless we have some indications in the drawings made by our observers both for these retroactive and anticipatory influences, the latter, however, being indicated more clearly and more abundantly.

In order to see whether the knowledge of the previously learned pictures of a set was influenced by those of the same set subsequently learned we may compare the drawings of the same pictures made by the observers at different stages of their learning, but in their comparison we shall endeavour to eliminate the influences of the time factor as much as possible. We shall compare therefore a picture as it was known before the subsequent members of the set were learned with the knowledge of the same picture experienced immediately after it had been relearned, the subsequent members having been learned during the interval. In this comparison we must bear in mind that the knowledge of the picture in question should have been improved if there were no other stronger effect opposite to such improvement. We find an opposite effect of this kind manifested in the PETUL and MEVOZ sets. For example, observer E. had

quite determinate knowledge of the first PETUL after three learnings. He made a complete drawing of it as shown in Fig. V, No. 4. In the next eight sessions the subsequent four pictures of the set were each learned twice. In the 12th session, when the first PETUL was learned again, the drawing made immediately afterwards, shows a decided regression towards indeterminateness of details, the only determinate item being now the common character (drawing shown in Fig. XV). The third PETUL shows a regression of the same kind under the influence of the other members of the set. We have noticed a similar influence in the previously considered drawings of the first MEVOZ (see drawings Nos. 3 and 4 in Fig. XIII). The drawing No. 3 shows a square-like figure which was undoubtedly influenced by the subsequent pictures of the same set which are more regular figures than itself.



Fig. XV.

The retroactive influence, we may infer, was in our learning to some extent of a *levelling* character in that it tended to simplify previously learned pictures or make their differing characters indeterminate conjointly with the "time factor," which played the same part.

More prominent and of a more frequent occurrence was the *anticipatory influence* of the pictures previously learned upon the cognition of subsequent pictures of the same set. This influence was prominent in every first learning of a new picture of the set, very often also in any relearning of the picture, if the others of the set had been previously learned. One form of the influence in question may be taken to be that due to the interpretation of the first pictures in the different sets, in which the influencing factor was the past experience of the observers. We saw that confluence was there at the expense of the constitutive characters of the pictures. The kind of influence we are here concerned with is that which is favourable to the "abstraction" of the essential characters. This influence consists in making the character in question appear as a prominent one in any subsequent picture (cf. determined apperception and apperceptive confluence¹ of Ach and other authors); or at least it facilitates the cognition and retention of that character alone. "Anticipation" does even more: by over-stressing repeated characters, the whole "balance" of the picture is temporarily affected by confluence. We refer again to the examples cited with reference to SABOM². In drawing

¹ "Apperzeptive Verschmelzung."

² Fig. IV, p. 22.

No. 2 in Fig. IV the character "root" developed in learning the first picture. In drawings No. 3 and 4 (which represent the second picture) that character appears so much stressed that it threatens to overthrow the balance of the "constitutive whole" of the picture. Only after repeated learnings the other, differing, characters develop as well until in No. 6 the balance of the characters is finally established. The same transformations occur in the third, fourth and fifth SABOM (see drawings 7, 8 and 9 in Fig. IV representing the third SABOM). For further examples we may refer to the drawings of PETUL, shown in Figs. V, VI, VII and VIII.

In our learning anticipating has very often had a negative influence upon an individual picture. When a member stands apart from the set, viz. when its differing characters are too much stressed, this member could only be assimilated to the group with great difficulty. This happened invariably in all those sets which we shall designate later on as "tied" sets. If all the members show some uniformity in displaying their characters with the exception of one picture which is more or less "freely" displayed, and if the common character has already been cognised in all the preceding members, the "free" picture suffers both in being cognised and retained. Often, even after repeated learnings, such a picture could not be determined as an individual. In reviving the meaning of that individual there is often a *confusion* of the common character already fixed and one of the non-essential characters—usually colour—of the individual in question.

DISINTEGRATION.

Throughout all the changes which the knowledge of our pictures underwent both in its progressive and regressive direction, there was a steady disintegration¹ of the common character from other differing ones. In the learning of the pictures from the second member onwards, at first the only part of the pictures differentiated was the character common to the set ("sinus," "indentation," "both ends the same," and the like). Later on, when the pictures were fully determined, that character was always reported as the most prominent. Still later, when the knowledge reverted to its initial indeterminateness, or when the pictures were confused with other pictures of the same set, the common character was again the only determinate part. Thus, while the differing characters were changing ((1) growing

¹ See Spearman, *op. cit.* p. 266.

from indeterminateness, (2) being fully determined, and (3) falling back to indeterminateness again), the common character which was essential to the set did not change when it had once been grasped. The only change was that at first it was *the only determined* character; then at the second stage that it was the *most prominent* of all the characters and at last that again it was *the only determinate one*. We can thus find between the drawings of the pictures numbered 2, 3, 4 and 5 in all the sets, made at different stages of learning, two drawings of the same picture which are more or less identical. One of these represents the initial stage from which the growth began. The other represents the stage at which the regression ended in indeterminateness. Both drawings represent the same *common character with the same degree of determinateness*. The only difference is that one represents the *initial stage of the ascending transformation* of meaning; the other, the *final stage of its descending transformation*. *One single reaction to a word by getting its meaning offers a recapitulation of all the slowly ascending determination, which was accomplished only after many repeated learnings*. When the observer reacts to the name of a picture, the *common character* again appears in most cases as an *initial phase of securing the meaning*, while the other characters appear only subsequently to this, if there is enough time for them to develop. Here again the characters are being *disintegrated*, especially so if the observer is satisfied with knowledge of the initially given character and refrains from all further determination. In this case this meaning is *abstract*.

Disintegration could only be effectively accomplished when the common character was cognised as such (viz. the relation of similarity grasped). On the other hand, it was adequate only in so far as the character *essential* to the whole set was recognised as common. We have cited two examples where these two conditions were not fulfilled. In one case observer C. could not grasp the relations in most of the sets and the pictures remained for him only separate "individuals" and not "members" of the set. In another case observer B. did find some relations between the pictures of the SABOM set, but the character found as common was not adequately essential to the set (was not constitutive to the set). In the first case there was no disintegration of the common character; but a fixed integration of the characters into individual wholes which remained "tied" among themselves (usually "tied" to their respective associates). In the second case there was disintegration (and nothing else); but this

disintegration was *not* one between the essential and non-essential characters. The pictures were "broken" into unrelated bits¹ which could form neither "wholes" of the individual pictures nor a "whole" for the set and which thus remained "and-connections"² or "conjunctions."³

The character which was essential to a set was differently represented in various sets. This difference proved to be significant for the kind of changes through which the knowledge of the different pictures developed both progressively and regressively. It was to be no less significant for evolving the abstract concept of the sets and its generalisation. Some sets consisted of pictures which were simple in their "structure" and easy to cognise as similar (BOGIL). Some were composed of pictures with a greater number of details; but these were displayed in a regular fashion so that the individuals formed a compact group of pictures (e.g. LUMIG, DIPUV). Other sets consisted of pictures in which the common character was more or less disguised under the appearance of the individual "wholes" (PETUL, SABOM). Although some sets were transitional varieties, two extreme types, as regards their essential character, stand out above them all. One may be exemplified by the BOGIL, another by the PETUL set. The first type represented those sets in which the essential character was determined by the individual pictures in their entirety; while in the pictures of the second type, only one principal "portion" of the picture was common. This was a central character which as common to them all could not be affected by any alteration of the other characters. The character in question was so to speak independent from the rest of the picture and yet it determined it as a member of the set. For further reference we might call this type of essential character "free." In another type of sets the essential character was "tied" to the individual "wholes" which determined it and which at the same time may be regarded as "tied" members of the set (in the same way as different triangles in which triangularity as essential is "tied" to each individual). It is needless to say that the common character was easier to grasp in "tied" than in "free" sets.

Now, both growth of the knowledge and disintegration of the

¹ Cf. drawings shown in Fig. III, p. 21.

² "Und-Verbindungen"; cf. Koffka, *op. cit.*, *Brit. Journ. of Psychol.* xv, 1924, p. 157.

³ See "relation of conjunction" in Spearman, *op. cit.* p. 72.

characters were different in these two types of sets. While in "tied" sets the structure of the pictures was quickly grasped, in "free" sets the process of growth was more or less long and slow (e.g. differentiation out of "sinus" as a nucleus in PETUL). With regard to disintegration of the characters this was effected in "tied" sets by way of simplification (e.g. in BOGIL, LUMIG and to some extent MEVOZ and DIPUV); whereas in "free" sets it was by way of a growing determinateness of the essential and a falling back to indeterminateness of the non-essential characters, together with "confusion"¹ of the pictures of the same set. (The best examples of this type are PETUL, and to some extent SABOM; while MEVOZ and PIMEF were transitional types partly because of their characters and partly on account of individual treatment by different observers.) *Simplification of the pictures in "tied" sets did functionally for the disintegration of the essential character what the slow falling away to indeterminateness did in the "free" sets.*

The functional difference in disintegration in these two types of sets may be correlated with the phenomenological aspect of the essential character in the respective sets. With those observers who were of a sensorial type, the essential character in "tied" sets tended to be represented in consciousness by a SCHEMATIC IMAGE which could be taken to represent a type of the picture; but nevertheless as a fact represented a "WHOLE" picture. On the other hand the essential character in the "free" sets tended to be represented in consciousness by the same observers either as a fragmentary image of that particular part of the picture which was essential, or, more frequently, had a VERBAL representation. If it was not "imaged" but known imagelessly, it again was known in the same "free" way. E.g. here is the report of observer E. given in his 17th learning session:

"PETUL was recognised as a word. Meaning developed gradually as a figure with curious indentations. No image. A little mental effort."

This was followed by observer's note:

"Everything but that little indentation was absent; and that indentation had no special position or relation to anything else. It was simply an indent and all the rest of the figure was fallen away." PETUL, R.T. 0.8 sec., prot. 117.

The observer drew that part of the picture after giving his introspection as represented in Fig. XVI. Both introspection and drawing show the essential character as a complete abstract.

¹ Cf. the fact that there was rarely any confusion in the BOGIL set.

Once disintegrated, the essential characters become fixed. This fixation, in some of the sets, begins together with disintegration as soon as the second member has been learned. We have already seen¹ that if the essential character was grasped in the preceding pictures, the subsequent pictures that do not conform easily to that character are sometimes determined "negatively"; i.e. they are not grasped with any new independent character; but are related to the character already cognised as "different." "Negative determination" thus served to integrate in it the individual pictures that would otherwise appear "split off" from the group.



Fig. XVI.

A good example of such negative determination of individual pictures, and at the same time their successful integration into the class, is the SABOM set for observer E. For all other observers this set was the most difficult. One of them could not form any general meaning of it at all; another could form neither general nor individual meanings; two formed a general meaning, but for both of them two pictures of the set remained "split off" from the group. But observer E. not only could "integrate" all the pictures into a class, but that set had for him in obtaining the meanings the shortest reaction time of all the sets. Now, this is the set in which he used "negative determination" of "individuals" more than in any other. When we consider that the essential character in each of our sets was that which was "constitutive" of it, and that the "individual" which was "negatively determined" was a fundament related to this character, we can then understand why observer E., who was able to grasp relations better than any other observer, succeeded more easily than anyone else in obtaining both general and individual meanings for this set and its individual pictures. The extreme opposite case is that of observer C., for whom the pictures in most of the sets remained "individuals" without being integrated into a class at all. In the first case we have a "fixed" character; and the pictures that do not fit this character become only negative cases or varieties² of the same class. In the second case, the individuals that do not easily fit into the class do not become varieties of it, but are virtually "classes" for themselves.

Fixation of the essential character is usually supported by some

¹ pp. 24, 36.

² Cf. classification in descriptive sciences.

verbalisation¹. The verbalisation does not serve fixation equally well in the two types of our sets. We have already seen that it is employed more in the "free" than in the "tied" sets. In the "free" sets verbal designation of the essential character may begin as soon as the character has been grasped. This designation may be at first an abbreviated sentence expressing a judgment which was made on the first recognition of the character, e.g. "both ends the same," "amoeba-like figure" and the like. Later on it may be condensed into a still shorter expression; and at length in this way may become a second name (given by the observer) for the set, over and above that (nonsense word) originally given to it by the experimenter.

FREE EDUCATION.

Up to this point we have followed the formation of abstract concepts in regard to our sets through its different phases. Their formation was slower or quicker according to different sets and different observers; but in general it was relatively slow, extending over many repeated learnings of all the pictures. We shall now consider a few cases in which it occurred quickly and with a rather sudden insight before all the pictures of the set were known or at least long before the learning period was completed. This occurred with some of our observers in the case of two "tied" sets. For example, observer B. reports after the first learning of the third BOGIL as follows:

"BOGIL has a clear meaning. No image came until after I reacted. (I feel the meaning is clear to me as a 'chair' or 'table' or any language word. I can get three different images of BOGIL. I *could invent* a new BOGIL myself.)" BOGIL, R.T. 1.8 sec., sixth learning session, prot. 39.

The same observer reports after the learning of the third LUMIG (after all the pictures of the same set had been learned previously) as follows:

"Saw LUMIG and felt I ought to know it, and did not. There seemed to be a moment of strong consciousness of action and a meaning came in an intentional way, succeeded immediately by fairly clear imagery. (I think the image is one I *invented*; it did not belong to any picture of the set.)" LUMIG, R.T. 2 sec., 15th session, prot. 105.

The observer then drew what was represented by his image and the drawing is no particular picture of the set, but rather a "type" which could be taken as any of its members.

¹ Cf. Fisher, S. C., *The Process of Generalising Abstraction*, Psych. Mon. 1916.

Now, both these sets are sets the essential character of which lies in the "wholes" of the pictures themselves. The observer reports very frequently in the case of other sets also images which he designates as "composite," "generic," "schematic" and "fragmentary"; always explicitly stating that they do not represent any particular picture of the set. But he never reported of these images that he "invented" them; while he often expressed this with regard to the BOGIL and LUMIG sets. The same invention may be inferred in his case from the drawings made for the DIPUV pictures.

We can compare with the introspections cited above those of observer E. as regards the same point. He reports as follows:

"Knowledge that LUMIG was a trifoliated figure. Intentional direction towards the first brownish LUMIG standing on one end. The meaning is at once sharper in definition than any of the LUMIGS. (No LUMIG that I have learned is a good example of the meaning of this word. If I were to draw LUMIG as I mean it, it would be a well-balanced figure like a double fleur-de-lis with the triangle attached to the place where they are joined.)" LUMIG, R.T. 0.8 sec., 25th learning session, prot. 179.

The drawing made is Fig. XVII.

In all the three protocols cited we take the passages which we have put in brackets partly as descriptions and partly as statements and explanations of the processes involved in getting the meanings of the respective words. They have a functional significance and are more fruitful to us than the preceding merely introspective descriptions of the phenomena observed. We find in them *indications that quite new mental products were evolving out of the learned material*. If we apply again Spearman's noegenetic principles as ultimate explanatory laws we have here the case of the "free eduction" of a concept¹. From the knowledge of three pictures alone, in one case, and of all the five pictures of a set in another, the observers were able at once to educe the general meaning as an abstract concept. There is no reason why this eduction should not appear from the knowledge of two pictures alone as fundamentals. If the observers knew that the subsequent pictures, not yet shown to them, would exhibit some regularity which they could thus predict, the abstract concept of the whole set could have been educed straightway from the knowledge of the two pictures of the set alone. But the sets, in which the varying characters were "freely" displayed, and the



Fig. XVII.

¹ See Spearman, *op. cit.* p. 272.

changes from one picture to another very great, probably made them cautious in predicting the essential elements of subsequent pictures in any set at once. And as soon as the relation between the first two pictures proved to be involved in the third picture as well, there was a possibility of "free education." No wonder that this could happen in "tied" sets only. In these sets the main features of each individual picture were determined by the "whole" in such a way that two pictures were enough to enable the observer to determine that "whole." *We might now surmise that even "simplification" in the sets previously discussed was actually an education of the essential character which "constituted" the whole set.* Thus a "simplified" picture would mean an educed essential of the set plus the reproduction of other items (colour, position, order and place in the set) which fuse with it, and determine in that way the individual picture in question. *At the same time we can also explain why such a "whole" ORGANISED BY RELATIONS would resist both confusion and growing indeterminateness for a relatively long time.*

GENERALITY.

Generality of the essential character after it had been "fixed," and often verbally labelled, was phenomenologically represented by a knowledge that the meaning was general, that it did not refer to any particular picture, but that it did refer to all the members of the set. We meet here the conscious phenomenon which has been designated by Aveling¹ as "conceptual overknowledge." This knowledge can now be accounted for on Spearman's first noegenetic principle, in which it is stated that: "Any lived experience tends to evoke immediately a knowing of its characters and experimenter."² This in our case means that the knowledge of the general character as an experienced knowledge tends to evoke a knowing that the character is general. This was for us, as a fact of introspection, the criterion that the essential character had attained the "character" of generality. We regard as another criterion of generality—and this time a functional one—the following.

We have shown that in "tied" sets the concept may be educed outright from two pictures of the set. The educed item represents then the whole set (its general scheme or type) and does not mean any particular picture.

¹ *The Consciousness of the Universal*, 1912, p. 201.

² *The Nature of 'Intelligence,'* 1923, p. 45.

But we have seen that the observers may be conscious that they could "invent" a new individual picture of the same set. This possibility of educing a NEW VARIETY as a further member of the set we take to have been (at least in some of them, e.g. "tied" sets) a real function of "generality" or universality of the concept. Virtually this criterion of generality may be applied to the concepts of all the sets; and indeed to all concepts with the character of generality. That the observers were able to educe a new member only in the case of "tied" sets (at least they did not report the same in others) is explicable by the fact that these represented a definite uniformity of relatedness of the members to their respective wholes. In these sets alone was there a possibility of facile prediction as to within what relations of a more determinate order the details were to be displayed. That not all observers who formed general concepts reported this possibility of educing is to be accounted for on the first noegenetic principle, i.e. that a lived experience tends to but need not necessarily be cognised as such. When the possibility of educing a new member appears in consciousness without any further determination, this member might be any conceivable picture that complies with the "constitutive whole" of the respective set. The positing of such a new determinable, but not determined, member virtually means the "negation" of individual determination (of all the pictures), and at the same time a "transcending" of the definite number of "individuals" in the class learned.

The educed concept does not only "transcend" the number of cases from which it was actually derived, thus extending to all possible cases of the same kind, but it may further "transcend" even the "kind" itself and embrace many "kinds." This happened in our learning period only in one set, i.e. BOGIL, with two observers. (At the beginning of learning the first BOGIL aroused some interest with most of our observers and until the end of our experiments that picture retained very strong associations originally made with it. It had all the time, so to speak, some "value.") Here is the report of observer B.:

"When I see BOGIL something in the shape of the general meaning always comes. I can't catch what it is, but the word BOGIL seems a little different from all the other names in the experiments. (BOGIL is my word standing for all your experiments.)" BOGIL, R.T. 0.6 sec., prot. 172.

Observer E. reports as follows:

"An intentional direction to the first blue BOGIL with a knowledge that that

was one of the BOGILS, but that BOGIL really meant any small flower-like picture. Indeed, it meant any small flower-like thing and was not limited to the pictures I have learned, or to any pictures. There was a knowledge that I could recall each picture I had learned in its proper order." BOGIL, R.T. 0.5 sec., 25th session, prot. 176.

In one case BOGIL meant more than its own set; it embraced all the sets used in the experiments. In another case it "transcended" even these. This is the only set in which the meaning reached such an abstract stage in our learning period; it became so to speak an "ideal" meaning, quite "freed" from the "real" characters which were implied in the actual pictures learned.

PART II

COMPLETION OF PART-SENTENCES.

Phenomenal Aspect of the Meaning of Subject in Judgments Made.

IN the second part of our experiments the observers made judgments with regard to the pictures learned during the first part. These judgments consisted in completing part-sentences in which the name of a set of pictures functioned as the subject. The procedure followed has already been described on p. 7.

Before discussing several points arising in our work with regard to processes involved in judgment we now propose to consider the phenomenal presence of the meaning of the subject. This has already been elaborately dealt with in Aveling's work on *The Consciousness of the Universal* and we have little to add to what has there been said. But since our material was of a different nature ("meaningless") from that employed by Aveling, we think it might be of interest to compare our results with his. At the same time the data concerning the phenomenal aspect of the meaning of the subject now presented will be of use to us later on when we come to consider other points in our research. For example, the question of the phenomenal presence of the meaning of the subject may be significant for the problem as to how its determination is necessary for predication. Moreover dynamic phenomena involved in this determination will be brought into relation with the data obtained.

Before presenting our data we should state that we did not especially ask our observers to introspect with regard to the meaning of the subject. They nevertheless regularly gave a full description of the phenomena as a result of the general instruction. We have accordingly taken for classification such points as we have obtained from their protocols. At the same time we wish to point out that individual differences between the observers were prominent, and for this reason—with regard to the presence of images and imageless knowledge, for example—we have thought it better to treat the protocols of one observer quite separately from those of the other four.

There were eight different kinds of part-sentences to be completed, i.e. eight different types of judgments to be made. Although some

of the judgments which were made are not logically of different types, and are to be included under the same heading, we have classified them all separately in our consideration of their phenomenal aspect. For example the part-judgments THE FIRST BOGIL IS — and THE BLUE BOGIL IS — belong to the same type; but there was a tendency for the subject to appear in a slightly different phenomenal manner in our experiments. We shall thus retain the division of judgments as they were presented for completion without implying by this any essential difference between some of the types. The types of judgments then, which were presented for completion were as follows:

- (1) THE FIRST MEVOZ IS —,
- (2) THE BLUE BOGIL IS —,
- (3) SOME SABOM ARE —,
- (4) ALL PETUL ARE —,
- (5) BOGIL IS —,
- (6) NO LUMIG IS —,
- (7) SOME DIPUV ARE NOT —,
- (8) THE FIRST PIMEF IS NOT —.

We have analysed all the protocols from all our observers with a view to finding out the manner in which the meaning of the subject was phenomenally present in consciousness in all these cases. We have classified all the data for four observers (A., B., C. and D.) in all the eight types of judgments in which the meanings of the subject were reported to be present as:

- (a) Imageless knowledge alone;
- (b) Imageless knowledge preceding and distinguished from images;
- (c) Images alone.

We have further classified the cases in which there was:

- (d) Presence of any image at all;
- (e) Knowledge of a general character of a set (concept) preceding other items of knowledge or images;

and

- (f) Knowledge of a general character (concept) subsequent to the other items of knowledge or images.

Items under (e) and (f) taken together give us the cases in which knowledge of the general character was present.

With regard to observer E. who is not a visualiser we were compelled to adopt the only classification indicated in his protocols. After analysis of all his recorded introspections we have classified the phenomenal presence of the meaning of the subject in his case as:

- (a) Presence of abstract knowledge, or presence of knowledge of a general character (concept), alone or preceding other items of knowledge;
- (b) Knowledge of individuals or other items, alone or preceding the general character; and
- (c) General character appearing in consciousness as subsequent to other items of knowledge.

Thus we could bring together the points under (a) and (c) from the protocol of observer E. with those under (e) and (f) from the protocols of the other four observers. We might consider all the cases of observer E. ((a) and (b)) to be of the same class as those under (a) (imageless knowledge) for the other observers, but we did not regard ourselves entitled to classify them together. While the other four observers frequently reported images connected with the meaning of the subject, observer E. reported such images only five times in all his experiments (140 protocols of which 127 were used for this classification, other completions of the judgments being failures)¹.

Each of the five observers had the task of making 140 "completion experiments" or judgments—the total thus being 700. In all there were 29 failures to make a judgment, of this number observer D. had 5, C. 6, B. 2, A. 3 and E. 13. The protocols analysed for the appearance of the meaning of the subject were thus distributed as follows:

Observers	Judgments made
D.	135
C.	134
B.	138
A.	137
E.	127
Total	671

¹ It might be objected that this observer perhaps did not pay enough attention to the images present. He did, and always explicitly stated whether there were present any sensorial contents or not. He always reported auditory-kinaesthetic images in reading the stimulus and giving the response. Almost all his predicates were expressed in an auditory-kinaesthetic way. Auditory-kinaesthetic images were also often reported by him as involved in the presence of some logical rule or some other operation mediating the adoption of the predicate. Also, for example, kinaesthetic images of eye-movements following "intentional direction" in determining an individual were often reported by him.

Table II.

Meaning of the subject in all judgments for four observers present as imageless knowledge alone.

Observer	Individual Affirmative %			Particular Affirmative %	Universal Affirmative %	General Affirmative %	Universal Negative %	Particular Negative %	Individual Negative %	Total No.
	FIRST BOGIL IS —	BLUE BOGIL IS —	Total	SOME BOGIL ARE —	ALL BOGIL ARE —	BOGIL IS —	NO BOGIL IS —	SOME BOGIL ARE NOT —	FIRST BOGIL IS NOT —	
1	2	3	4	5	6	7	8	9	10	11
A.	59	28	55	83	73	61	59	100	86	90
B.	11	0	11	0	13	14	33	0	40	20
C.	18	0	16	6	4	0	38	60	0	19
D.	4	0	4	20	5	15	41	17	40	20
Total	23	8	21	28	24	22	44	40	39	149 (27 %)

NOTE. There were 33 judgments for these four observers which were not included in this table or in any other table dealing with the phenomenal aspect of the meaning of subject. In these judgments the subject either had no introspectible meaning but it was correctly predicated (14 such cases in the Universal Negative Judgment which is 22 per cent. of all the judgments of that type), or the judgments were automatic, memory judgments and judgments as accepted items of knowledge so that the meaning of the subject could not be treated separately.

Table III.

Meaning of the subject in all judgments for four observers present as imageless knowledge distinguished from and preceding images.

Observer	Individual Affirmative %			Particular Affirmative %	Universal Affirmative %	General Affirmative %	Universal Negative %	Particular Negative %	Individual Negative %	Total No.
	2*	3	4	5	6	7	8	9	10	
1	2*	3	4	5	6	7	8	9	10	11
A.	26	28	27	27	9	16	0	0	0	22
B.	32	17	29	30	28	14	20	40	0	34
C.	40	17	37	29	20	40	6	0	22	37
D.	46	17	43	53	71	39	34	83	20	63
Total	36	19	34	31	32	28	14	35	11	156 (29 %)

* Column 2 represents percentages for the Individual Judgments of the type: THE FIRST BOGIL IS —; under column 3 are those of the type THE BLUE BOGIL IS —; column 4 is for all individual judgments.

COMPLETION OF PART-SENTENCES

Table IV.

Meaning of the subject in all judgments for four observers present as imageless knowledge alone or as knowledge distinguished from and preceding images.

Observer	Individual Affirmative %			Particular Affirmative %	Universal Affirmative %	General Affirmative %	Universal Negative %	Particular Negative %	Individual Negative %	Total No.
1	2*	3	4	5	6	7	8	9	10	11
A.	85	56	82	100	82	77	59	100	86	112
B.	43	17	40	30	41	28	53	40	40	54
C.	58	17	53	35	24	40	44	60	22	56
D.	50	17	47	73	76	54	75	100	60	83
Total	59	27	55	59	56	50	58	75	50	305 (56 %)

* See columns 2, 3 and 4 in Tables II and III.

Table V.

Meaning of the subject in all judgments for four observers present as images alone.

Observer	Individual Affirmative %			Particular Affirmative %	Universal Affirmative %	General Affirmative %	Universal Negative %	Particular Negative %	Individual Negative %	Total No.
1	2*	3	4	5	6	7	8	9	10	11
A.	15	44	18	0	5	0	6	0	14	13
B.	28	66	42	47	45	42	14	40	60	57
C.	15	33	18	12	19	7	19	40	78	28
D.	23	67	28	0	5	8	25	0	30	24
Total	20	52	26	15	18	14	16	20	45	122 (23 %)

* See columns 2, 3 and 4 in Tables II, III and IV.

The negative judgments in our experiments for the four observers classified together show *the largest percentage* of cases in which the meaning of the subject was present in consciousness as *imageless knowledge alone*. The Universal Negative Judgments have 44 per cent. of such cases, the Particular Negative 40 per cent. and Individual Negative 39 per cent. (Table II, columns 8, 9 and 10). The same judgments show in Table III (columns 8, 9 and 10) 14, 35 and 11 per cent. cases respectively in which the meaning of the subject was present as knowledge distinguished from and preceding images,

so that the percentages of cases in which the meaning of the subject was present either as knowledge alone or as knowledge preceding images is for the Universal Negative Judgments 58 per cent., for the Particular Negative 75 per cent., and for Individual Negative 50 per cent. (Table IV, columns 8, 9 and 10). Moreover the Universal Negative Judgments have also 22 per cent. of cases in which there was no meaning of the subject present as an introspectible item of experience. In these cases we must suppose that the predicate was educed correctly in a subconscious manner. Although there are great individual differences among the observers considered in these classifications, there is a tendency for every one of them to have the meaning of the subject as imageless knowledge alone in negative judgments on the whole more frequently than in affirmative ones. With regard to imageless knowledge taken together with knowledge preceding images one type of negative judgment, i.e. the Particular Negative (Table IV, column 9) has the highest rank of all judgments for every observer except B. whose highest percentage in this respect is represented by the Universal Negative Judgments.

Of all the affirmative judgments the Particular Affirmative has the largest percentage of cases (28 per cent.) in which the meaning of the subject was present as imageless knowledge alone (Table II, column 5). The Universal Affirmative follows this with 24 per cent., then comes the General Affirmative Judgment with 22 per cent. and finally the Individual Affirmative with 21 per cent. In respect of the cases with imageless knowledge alone taken together with those in which this was followed by images, the order would be slightly different. The Particular Affirmative remains still with the largest number of cases (59 per cent.) followed by the Universal Affirmative with 56 per cent.; the Individual Affirmative comes next with 55 per cent. and the General Affirmative is last with 50 per cent. (Table IV).

The order of all the judgments representing the percentage of the cases in which the meaning of the subject was present as (1) knowledge alone or (2) knowledge preceding and distinguished from accompanying images would be as shown in Table VI.

With regard to the presence of the meaning of the subject as imageless knowledge alone the Universal Negative Judgments (*E*) represent one extremity of the order with the largest percentage of cases, whereas the Individual Affirmatives stand at the other end with the smallest percentages (first row, column 7, Table VI). If we select from all the Individual Judgments those in which the prefix

Table VI.

(Percentages.)

	1	2	3	4	5	6	7
	<i>E</i> *	<i>O</i>	<i>SN</i>	<i>I</i>	<i>A</i>	<i>G</i>	<i>S</i>
Knowledge alone	44	40	39	28	24	22	21
	<i>O</i>	<i>S</i>	<i>A</i>	<i>I</i>	<i>G</i>	<i>E</i>	<i>SN</i>
Knowledge preceding images	35	34	32	31	28	14	11
	<i>O</i>	<i>I</i>	<i>E</i>	<i>A</i>	<i>S</i>	<i>G</i>	<i>SN</i>
Knowledge alone or knowledge preceding images	75	59	58	56	55	50	50

* The letters *E*, *O*, *A* and *I* are conventional logical signs for their respective judgments. *SN* is here used to denote the Individual Negative, *G* for General Affirmative and *S* for Individual Judgment.

word qualifying the subject meant a colour, the number of cases with regard to the presence of imageless knowledge alone falls to 8 per cent. (two cases from 25). The only two cases were recorded by observer A. who generally shows relatively small percentage of imagery. The other three observers (B., C. and D.) in this respect have not recorded one single case of this type of judgment (Table II, column 3). The same type of judgment has the largest number of cases recorded with the subject being present as image alone (52 per cent., Table V, column 3). However, the Individual Judgments relatively to other judgments exhibit a surprisingly high percentage of cases in which the meaning of the subject was present either as imageless knowledge alone or knowledge distinguished from accompanying images (55 per cent.). Indeed they excel in this respect even the General Judgments (BOGIL IS —), this being represented with 50 per cent. This can be accounted for by the difficulty of forming general concepts for some of the sets during the learning period. For some observers these were not abstracted often so as to be ready to be used in the judgments, but were only abstracted when the task of completing the part-sentences was presented. Even if a general character had already been developed—sometimes it was not yet quite “freed” from the meaning of individual pictures. For example observer C. has recorded 40 per cent. of cases in which the meaning was present as knowledge preceding images and 60 per cent. of cases in which images preceded knowledge, the presence of image being thus recorded in 100 per cent. of his cases. The same observer made the Individual Affirmative Judgment in 16 per cent. cases, Universal Negative in 38 per cent. and Particular Negative in 60 per

cent. cases without having any imagery (Table II). In trying to predicate a general character he often had to recall several "individuals" of the set, and naturally in this process there was every opportunity for images to emerge. Most of his General Judgments are collective in character. Even in the case of observers who already had the general concepts fairly established, the image of the picture which was "split up" from the group and thus did not fit in well with the general meaning tended to appear as a "contrary instance."¹ Apart from that, the general character itself was often connected either with a fragmentary image of a part of a picture which was common to the whole set or was verbally represented (e.g. "sinus," "root"). Sometimes it was symbolically represented by one of the pictures which was the best example or the best known one. This accounts for the fact that another observer (B.), who almost regularly experiences both visual and verbal imagery, has 42 per cent. of cases of General Judgments recorded in which there were only images present. However of the other observers two (C. and D.) have only 7 per cent. and 8 per cent. of cases (Table V, column 7) of the same kind recorded and the third (A.) has none, the fifth observer E., whose introspections are not classified here has also none. *It is a question for us whether it was possible for an observer to make a "good" judgment when the only determination of the subject consisted in an image.* We shall return to this point later on.

The Universal Affirmative Judgment offers a somewhat similar case in our experiments to that of the General Affirmative. Nevertheless it shows a relatively larger number of cases with imageless knowledge and knowledge preceding images (56 per cent., Table VI, the last row). It stands higher in that respect than Individual Affirmative, General Affirmative and Individual Negative, but it has lower rank than the Particular Negative, Particular Affirmative and Universal Negative. We have already shown that the *Negative Judgments*, generally, stand higher with regard to imageless knowledge than the affirmative ones. We saw also that the Particular Negatives stand higher with regard to the cases in which there was knowledge alone or knowledge preceding images than the Universal Negative Judgments. Among the Affirmative Judgments we again find, with regard to the same point, that the particular judgments have a larger percentage recorded than the universal (the bottom row of Table VI). It may now be generally stated from the data of

¹ Cf. Aveling, *op. cit.* p. 195.

our experiments and for the judgments made here that *when we abstract from the quantitative aspect of judgments, the negative judgments tend to have their subject represented with imageless knowledge or knowledge preceding images more frequently than the affirmative ones. On the other hand when we abstract from the qualitative aspect of judgments the particular show the same tendency as compared with the universal.*

To account for the larger percentage of the cases in question in the Particular Affirmative than in Universal Affirmative Judgments it is enough to state that the former involve in predicating more relations than the latter. We shall consider this point later and see how in the Particular Judgments both affirmative and negative the observers employed mostly the "method" of division, elimination and the like, all of which involve predominantly the eduction of relations and correlates. Apart from this, the same consideration already put forward with regard to the General Judgments applies to the Universal Affirmative Judgments. Here as well, or even more than in the General Judgments, the observers often had to review the whole set in order to predicate a universal character. The same observer (B.) e.g., who was quoted previously in the case of the General Judgments (showing there 42 per cent.), shows 45 per cent. of the Universal Affirmative Judgments in which meaning of the subject was present as image alone.

We may now compare the results of our experiments with those of Aveling¹ with regard to the phenomenal presence of the meaning of the subject in different judgments. In order to elucidate better both differences and agreement between the two we shall first give a classification of our results with regard to the phenomenal presence of the meaning of the different pictures during the learning period. We have not used for this classification the protocols of observer C. because only the other four observers set themselves from the beginning of the learning period to describe accurately all the phenomena with regard to the presence of meaning, whereas observer C. adopted that attitude only slowly in the course of learning. We shall add the results from the protocols of observer E., but we shall treat them separately as he is not a visualiser. Out of 164 analysed protocols there are only five cases recorded in which he reports kinaesthetic images as present (3 per cent.). He had eight cases in which there was knowledge distinguished from and preceding kinaesthetic images (5 per cent.). In four cases meaning was obtained by mere associa-

¹ *The Consciousness of the Universal*, London, 1912.

tion (2 per cent.). The remaining part consists of the cases in which the meaning was present as imageless knowledge, these being 147 in number or 90 per cent. of the whole.

Table VII.

Phenomenal aspect of the meaning obtained by observers A., B. and D. during the learning period. Number of the protocols analysed is 599 (failures not included).

Observer	Knowledge alone		Knowledge distinguished from and preceding images		Knowledge alone or knowledge preceding		Images alone or images preceding	
	No. of cases	%	No. of cases	%	No. of cases	%	No. of cases	%
A.	184	70	24	10	208	80	53	20
B.	27	13	34	16	61	29	146	71
D.	14	11	27	20	41	31	90	69
Total	225	38	85	14	310	52	289	48

Comparing the results obtained for three of our observers (A., B. and D.) during the learning period with those of Aveling obtained for the same period, we find several differences. In his experiments¹ "concepts occurred during the learning period with no mention of sensorial contents in 45 cases (7 per cent. of the total)." They occurred and were discriminated from accompanying sensorial contents in 35.5 per cent. cases. The 42.5 per cent. of the total number represents thus the cases in which the concepts were present in connection with and in the absence of sensorial contents². With regard to our results shown in Table VII for three observers, imageless knowledge was recorded in 38 per cent. of cases, which is very high compared with 7 per cent. of Aveling. Cases in which there was presence of imageless knowledge alone classified together with those in which knowledge distinguished from and preceding images was recorded gives us 52 per cent. which is approximately equal to 42.5 per cent. of Aveling. Very great difference lies between our and his results in regard to the number of cases in which knowledge was reported together with images but distinguished from them. Our results show only 14 per cent. of such cases (his 35.5 per cent.). Two of our observers (B. and D. in Table VII) show 13 and 11 per cent.

¹ *The Consciousness of the Universal*, p. 106, Table IV.

² *Ibid.* p. 180.

of cases respectively in which imageless knowledge present alone was recorded. This is somewhat near Aveling's 7 per cent. of cases with similar contents. Observer A. shows indeed a very high percentage of the cases in question (70 per cent.). This is why the cases under column 2 (Table VII) show such discrepancy with the results of Aveling (our 14 compared with his 35.5 per cent.). Again, two observers who in recording the cases with imageless knowledge alone agree approximately with Aveling's observers, do so to some extent in showing the greater number of cases in which knowledge was recorded as distinguished from and preceding images. It may be that our three observers taken for this classification were not so able as Aveling's to separate accompanying images from preceding imageless knowledge and thus recorded more cases with imageless knowledge alone than cases with imageless knowledge plus images. At least one observer certainly did so. But both researches agree in general in recording notional knowledge as present at all (our 52 per cent. as compared with Aveling's 42.5 per cent.).

With regard to the phenomenal presence of the meaning of the subject recorded in our judgments as compared with those of Aveling's work the results are as follows. His 31 per cent. of cases in which the subject of the Universal Affirmative Judgments was reported as a concept correspond to our 24 per cent. of cases in which imageless knowledge alone was recorded; his 37 per cent. of cases in which a concept was discriminated from accompanying sensorial elements correspond to our 32 per cent. In the case of the Universal Negative Judgments concepts were reported 33 per cent. times as compared with our 44 per cent.; while concepts discriminated from accompanying sensorial elements were recorded 47 per cent. times as compared with our 14 per cent. So far the only difference in this last percentage is of the same kind as that already found in comparing the results taken from the learning period, i.e. it concerns the cases in which concepts were recorded as distinguished from accompanying images (14 per cent. as compared with 47 per cent.). But our two observers (B. and D.) whose results were found to agree more or less in the recording of these cases during the learning period with Aveling's observers do so to a great extent in the "completion experiments." In Table III, column 8, they show a relatively higher percentage in this respect (20 and 34 per cent.) approaching thus the percentage in Aveling's results. *All the other data agree more or less fully.* Our results and his agree also in that the Universal

Negative Judgments show a larger percentage of imageless items of experience than the Universal Affirmatives.

Difference, however, is quite prominent in respect of the Individual Judgments. While, according to Aveling, "the meaning of the subject in individual judgments was *dubitably* given without imagery in 4 per cent. of cases," in our experiments no imagery was reported in 21 per cent. of the same judgments. Only those Individual Judgments of ours in which the word prefixed to the subject was an adjective designating a colour, instead of a number, show 8 per cent. of such cases, which is fairly approximate to the low percentage of Aveling's Individual Judgments. There is full agreement with regard to the cases in which concepts were recorded together with images in the same judgments, our number of such cases being 34 per cent.; while his is 35 per cent.

Lastly, we shall compare our results with regard to imagery reported alone with the cases of Aveling in which the presence of imagery was noted by his observers as giving the meaning of the subject¹. Our results show 18 per cent. of the cases in question in Universal Affirmative Judgments as compared with 24 per cent. of his. Our 16 per cent. for Universal Negative Judgments fully agrees with his 16 per cent.; and finally our 26 per cent. for Individual Judgments corresponds to his 55 per cent. for the same judgments. In this case there is a discrepancy. But if we take again only those Individual Judgments in which the subject was qualified by the name of a colour, our results show 52 per cent. of the cases in question as compared with 55 per cent. of his. Thus in one type of Individual Judgments at any rate there is full agreement.

From Table VIII it may be seen that the only prominent disagreement between our results and Aveling's is in respect of the records of notional knowledge distinguished from and preceding images in Universal Negative Judgments (column 7) and imageless knowledge in Individual Judgments. The first may be to some extent accounted for by the fact that in our experiments the Universal Negative Judgments include 22 per cent. of cases in which these were made in such a way that the predicate was educed without the meaning of the subject having been introspectible or recorded at all. This has undoubtedly lowered our percentage in column 7. In the case of the Individual Affirmative Judgments there is only a partial agreement, i.e. between his Individual Judgments and one kind of our

¹ Aveling, *op. cit.* p. 187.

Table VIII.

Comparison between Aveling's results and ours concerning the phenomenal presence of the meaning of the subject in judgments.

(Percentages.)

Results	Universal Affirmative Judg.				Universal Negative				Individual Affirmative			
	Image-less knowledge alone	Knowledge preceding images	Total	Images	Image-less knowledge alone	Knowledge preceding images	Total	Images	Image-less knowledge alone	Knowledge preceding images	Total	Images
1	2	3	4	5	6	7	8	9	10	11	12	13
Aveling	31	37	68	24	33	47	80	16	4	35	39	55
Ours	24	32	56	18	44	14*	58	16	21 (8%)†	34	55	26 (52%)†

* There were 22 % of cases of Universal Negative Judgments in which the meaning of the subject was reported as not introspectible although the judgments were completed.

† The percentage represents the Individual Judgments of the type THE BLUE BOGIL IS —.

Individual Judgments¹ as mentioned already (4 v. 8 per cent.). If we take the data of each of our observers separately for the two types of Individual Judgment the results are shown as follows:

Table IX.

The meaning of the subject in Individual Judgments recorded as imageless knowledge alone for four observers.

(Percentages.)

Observers	Type of judgment THE FIRST BOGIL IS —	Type of judgment THE BLUE BOGIL IS —	Total
1	2	3	4
A.	59	28	55
B.	11	0	11
C.	18	0	16
D.	4	0	4
Total	23	8	21

¹ Aveling's Individual Judgments had mostly a subject qualified by the words like "smallest," "largest" and the like. Our material being meaningless it was difficult to find for each individual picture a suitable adjective which would be applicable to the picture and at the same time serve as a univocal determination of it. Such univocal qualifying words in our material were only numerals or adjectives designating colours. The Individual Judgments with a subject which was qualified with a colour, show similar phenomenal aspect of the meaning of the subject to that shown by Aveling's Individual Judgments, while the judgments in which the subject was qualified by a numeral exhibited

Observers B., C. and D. did not record one single case in Individual Judgments of the type *THE BLUE BOGIL IS* — in which the meaning of the subject was present as imageless knowledge alone. Their percentages in the type of judgment *THE FIRST BOGIL IS* — (11, 18 and 4 per cent. respectively) almost exactly agree with Aveling's 4 per cent. for Individual Judgments. Observer D. shows the same percentage. Only observer A. has recorded a very high percentage in this respect and has thus distorted the possible agreement of our data for Individual Judgments with those of Aveling.

Presence of the General Meaning of the Subject in Judgments.

We shall now consider the presence of the general meaning of the subject in different types of judgments. For this purpose we have analysed the protocols of all our five observers. In order to compare the spontaneous appearance of the general meaning of the sets with that which was influenced by the task imposed upon the observers we have analysed also the protocols of those judgments for the completion of which there was no necessity for a general meaning to appear. With the same view we have classified all the cases into (a) those in which the general meaning was present as distinguished from and preceding other items of experience, or was present alone, (b) those in which it was present as subsequent to such items.

Table X.

Presence of the General Meaning of the Subject in Judgments.

(Percentages.)

	Individual Judgments (FIRST B. IS —)			Individual Judgments (BLUE B. IS —)			Particular Affirmative			Particular Negative			Individual Negative			Universal Affirmative			Universal Negative			General Judgments		
	1*	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
18	0	18		0	0	0	67	0	67	0	0	0	0	0	0	54	23	77	42	12	54	23	69	92
21	0	21		0	0	0	18	0	18	20	0	20	0	0	0	48	35	83	40	13	53	23	62	85
13	0	13		0	0	0	6	0	6	0	0	0	0	0	0	10	24	34	12	0	12	0	40	40
33	0	33		0	0	0	47	0	47	83	0	83	10	0	10	57	24	81	56	0	56	53	27	80
68	0	68		20	0	20	64	0	64	27	0	27	22	0	22	64	14	78	50	12	62	64	14	78
30	0	30		3	0	3	38	0	38	30	0	30	6	0	6	46	24	70	40	7.5	47.5	33	41	74

the columns 1 represent the cases in which general meaning was present either alone or preceding other items; columns 2 represent presence as subsequent to other items; columns 3 represent the total of the two.

quite a different phenomenal aspect. We shall submit later on the explanation why the stimulus, e.g. *THE FIFTH BOGIL IS* — is more likely to arouse the meaning of the subject in an imageless way, while the stimulus *THE BLUE BOGIL IS* — tends to arouse an image of that individual.

The largest percentage (46 per cent.) of the cases in which the general meaning of the subject was present either alone or preceding other items of experience occurred in Universal Affirmative Judgments. The next in this respect are Universal Negative Judgments with 40 per cent.; then come Particular Affirmatives with 38 per cent. and lastly General Judgments with 33 per cent. of cases. The general meaning was present as a preceding item of knowledge (as may be seen from Table X) even in the judgments in which there was no need for it to appear from the point of view of the task. For example in the Individual Judgments of one type (THE FIRST BOGIL IS —) such cases represent 30 per cent., in the Individual Negatives 6 per cent. and in the Individual Judgments of the type THE BLUE BOGIL IS — 3 per cent. The phenomenal appearance of the general meaning of the subject in Particular Negative Judgments depended in the cases of different observers largely upon the individual method of solving the task and shows a total of 30 per cent. (the distribution for all observers being 0, 20, 0, 83 and 27). If the general character of a set had been fairly well abstracted by an observer, it tends to appear previously to other items whatever part-sentence may be exposed for completion. Exceptions to this rule are in our experiments the Individual Judgments of the type THE BLUE BOGIL IS —, and all other Individual Judgments in which the subject meant a picture which was not "tied" to the group¹.

There is one significant point with regard to the appearance of the *general meaning* of the subject in different judgments. *While it tends to appear as a preceding item in all the judgments, it appears as subsequent only in those in which it was indispensable for evoking an adequate predicate.* Of all judgments the meaning was present as subsequent to other items only in *Universal Affirmative, General Affirmative and Universal Negative Judgments* (in the first case 24 per cent. times; in the second 41 per cent. times and in the third 7.5 per cent. times). *The appearance of the general meaning as preceding other items in all judgments and its appearance as a subsequent item only in the above cases, indicates undoubtedly the effect of the general instruction to complete the presented part-sentence and the specified task implied in the part-sentence itself when it has been presented.* The effect of the task is already indicated by the fact that the general meaning appeared as a preceding item in a larger percentage of cases in these judgments than in the particular and individual ones; but a more

¹ Cf. the learning period.

cogent indication lies in its appearance as a subsequent item not in these but only in the Universal and General Judgments. Moreover, the influence of the task is indicated by the different distribution of the cases in question in different judgments in which the general meaning was needed in order to predicate. For example, General Judgments show 41 per cent. of such cases; Universal Affirmatives 24 per cent.; and Universal Negatives 7.5 per cent. The presence of the general meaning as preceding other items in the last two types of judgments (46 and 40 per cent. times respectively) shows that the *prefix words "all" and "no" acted as more defined tasks for the recalling of the general meaning at once* than the absence of such a "quantifying" prefix word. Probably due to this the General Judgment in its presented form as BOGIL IS — gave only 33 per cent. of cases in which the general meaning was revived at the outset. If the cases are taken in which the general meaning was present at all, the General Judgments then show 74 per cent.; Universal Affirmatives 70 per cent. and Universal Negatives 47.5 per cent. The last percentage, relatively small as compared with the other two, will be explained later on when we discuss the methods of our observers in completing the judgments, and the processes involved therein.

We may now summarise the quantitative data concerning the phenomenal presence of the meaning of the subject in the judgments made by our observers. The meaning of the subject was present as imageless knowledge alone in all the judgments of four of our observers in 149 out of 544 cases (27 per cent.). It was further present as imageless knowledge distinguished from and preceding images in 156 cases (29 per cent. of the total). *It appeared thus either as imageless knowledge alone or as knowledge preceding images in 305 cases (or 56 per cent.) of the judgments.* Observer E., who is not classified here, reported in 127 analysed protocols images involved in the meaning of the subject only five times, which is 4 per cent. of the total. If we were to add his 122 cases in which imageless knowledge was reported to the 149 cases of the other four observers we should have then 271 of the cases in question out of a total of 671. This would give us 40 per cent. of cases in which imageless knowledge alone was reported as present.

With regard to the relative amount of the percentage of cases in different judgments in which the meaning of the subject was present as imageless knowledge alone, we have shown for four observers that

these were larger in the Negative Judgments than in their corresponding affirmative ones. The extracted data from Table II are as follows:

	Negative	Affirmative
Individual	% 39	% 21
Particular	40	28
Universal	44	24

With respect to the presence of the meaning of the subject reported as imageless knowledge alone or knowledge distinguished from and preceding images, Universal Affirmative and Particular Affirmative, with their corresponding Negative Judgments, give the following relative percentages (from Table IV):

	Particular	Universal
Negative	% 75	% 58
Affirmative	59	56

The presented data show a rising of the percentages of recorded cases in question in passing both from Affirmative to Negative and from Universal to Particular Judgments.

If we compare the percentages of all the judgments (last row in Table IV) taken individually, they do not vary much from the total 56 per cent. (55, 59, 56, 50, 58, 75 and 50 per cent.). The only exception is 75 per cent. in Particular Negative Judgments. From this it may be concluded that *the meaning of the subject tends to appear either as imageless knowledge alone or as imageless knowledge distinguished from accompanying images in all the judgments with almost equal frequency.* (This will hold equally well for the cases in which the meaning was reported either as image alone or as image distinguished from accompanying knowledge, i.e. 100-55 per cent., 100-59 per cent., 100-56 per cent. and so on.) The frequency of such appearance of the meaning in all the judgments except the Particular Negatives is not lower than 50 per cent. nor higher than 59 per cent. At this conjuncture we wish to stress not so much the fact that the number of cases, in which the meaning of the subject was experienced either as imageless knowledge or as a knowledge preceding images, amounts to 56 per cent. of the total, as the fact

that these cases were almost equally distributed in all the different types of judgments except the Universal Negative. Once we accept the fact that imageless knowledge reported as distinguished from sensorial contents actually occurs, there is in principle no reason why the former should appear in some judgments more frequently than in others. The differences seemed to depend in our experiments largely on the method of solving the task, i.e. completing a judgment; and, in so far as this is different in respect of different judgments, these may exhibit strikingly different phenomenal aspects (e.g. the Universal Negative and Particular Negative Judgments). Other "individual differences" (sensorial or non-sensorial types and their varieties) influence the phenomenal aspect of the meaning of the subject also. But here again *if an observer for example shows a high percentage of imageless items of experience in one type of judgment, he is apt to show the same high percentage in other types also, no matter whether they were individual or universal, affirmative or negative.* A similar observation also holds good with regard to the observers who record a low percentage of such cases.

Our results in respect of the phenomenal aspect of the meaning of the subject in judgments corroborate all the results of Aveling except those in respect of the meaning of the subject present as imageless knowledge alone in the Individual Judgments. We accounted for that difference when we compared the results of our research and his. Nevertheless, though this difference does not appear so striking, we cannot quite agree with Aveling's conclusion based on his results that "there is a tendency for the meaning of the subject in 'individual' judgments to be phenomenologically present with a distinctly imaginal character,"¹ nor with "The 'individual' is phenomenologically present in consciousness as a concept in connection with sensorial contents (image), when we think 'this man' we have imagery of some sort. The image best securing 'individual' thought is the direct image, or percept."² While fully corroborating his results with regard to the presence of the meaning of the subject in judgments as an imageless knowledge whether alone or distinguished from and accompanied by images, we think, on the basis of our results, that *the meaning of the subject in Individual Judgments*³ *tends as frequently as in Universal ones to be present as a knowledge without any accompanying (or being connected with) sensorial contents at all* (cf. Table II, columns 4, 5, 6

¹ *Op. cit.* p. 189.

² *Ibid.* p. 242.

³ An exception in our experiments was the type THE BLUE BOGIL IS —.

and 7, especially 4, 6 and 7). The conclusions we have drawn already with regard to the equal frequency with which imageless knowledge accompanied by images appears in all judgments except Particular Negatives can be applied to this particular case also. We accordingly submit that *the meaning of the subject in Universal and General Affirmative Judgments tends to be present as KNOWLEDGE CONNECTED WITH IMAGES as frequently as in the Individual Judgments*¹. A still further corollary, or better another expression of the same fact would be that the meaning of the subject in Universal and General Affirmative Judgments tends to be present as frequently as in Individual Judgments¹, as image alone or image accompanied by knowledge. (This all holds good when we abstract from individual differences. When we take observers individually, as we have previously shown, we find differences only in passing from one observer to another, not in passing from one type of judgment to another in the case of the same observer.)

Examples of Meaning of Subject in Different Judgments.

THE FIRST BOGIL IS (small blue figure). Introspection: "A start on hearing the buzzer. Recollected attention. BOGIL stood out from the stimulus. Then auditory—kinaesthetically: 'first BOGIL is small blue figure.' There was a knowledge that it was flowerlike, of its position on the card and the whole was in a direction towards the left. The reaction appeared to be largely associative. There was very little consciousness of action." Observer E., R.T. 1347, prot. 4.

THE FIFTH DIPUV IS (green (assent to)). Introspection: "When I saw the word DIPUV, a very complicated item of knowledge developed. It was not entirely imageless. There were a few words and some schematic visual imagery. That item was equivalent to this: 'fifth DIPUV is in the same position as the third.' At that there was no visual imagery. Then I knew it was green; and the word 'green' appeared. Then there were fleeting images of the third, fourth and fifth, leaving the fifth in the focus of consciousness; its shape, colour, position and everything, and there was just an assent to that (to the image) and a feeling of correctness and satisfaction." Observer B., R.T. 3146, prot. 23.

THE SECOND BOGIL IS (pink). Introspection: "When I saw the stimulus I read 'second BOGIL is,' and immediately finished by inner speech: 'pink,' but I stopped then to verify that fact. The first BOGIL came clearly, then the knowledge that the second and third were practically of the same shape, that the third was red and so was the fourth. Then I made a judgment: 'the second BOGIL is pink' with an absolute feeling of sureness." Observer A., R.T. 1726, prot. 25.

THE THIRD DIPUV IS (like the fifth). Introspection: "I first tried to revive the third DIPUV from the left hand end. Then suddenly developed an item of knowledge and awareness that the third and fifth DIPUV were in the same

¹ An exception in our experiments was the type THE BLUE BOGIL IS —.

position. There was no imagery there. I formulated a judgment here with a sort of intentional direction (mental gesture) towards the place of the third (no image yet) and said: 'third DIPUV is like the fifth.' There was clear knowledge of the respect in which they were alike. At the end of judgment a very vague form appeared, which I recognised as the form of the third DIPUV." Observer B., R.T. 2990, prot. 37.

THE FIRST DIPUV IS (standing up). Introspection: "Read stimulus in three moments: 'first — DIPUV — is.' Attention concentrated on DIPUV. Meaning came that DIPUV in the abstract was a 'y'-shaped figure. Knowledge that in concrete they were in different positions and colours. Belief that the first DIPUV was erect like a pointed 'y.' Word 'standing up' came auditory—kinaesthetically and was accepted as sufficient characteristic. The judgment was entirely individual but there was not much belief either that I did know the first DIPUV or that it was standing up." Observer E., R.T. 3017, prot. 16.

SOME MEVOZ ARE (big). Introspection: "When I saw stimulus I read: 'some MEVOZ are' and then stopped. Then I thought: 'toothed,' but that was not right because *all* MEVOZ were toothed—then I started to recall them by colours. I got the blue, green and pink. Then I got the feeling: 'It is useless, because no two MEVOZ are the same colour.' Then I started to compare them by size, and I remembered that the pink and the blue are big compared with the green. Then I thought: 'They are all big except the green,' but there was a feeling that I could not get any more satisfactory adjective. So I gave the response: 'Some MEVOZ are big' and thought it was rather puerile." Observer A., R.T. 3055, prot. 13.

THE FOURTH LUMIG IS (pink). Introspection: "When I saw the stimulus I read: 'fourth LUMIG' and immediately there was consciousness of several sharp projections. They took shape, i.e. positions, as being three on the upper surface of the figure. Then there was knowledge of pinkness, and I made a judgment: 'fourth LUMIG is pink' feeling very sure. (This word LUMIG has a cluster of these small angles associated with it. As soon as I see the word, there is that consciousness of angles, but no visual images of them. There seem to be confusion of the general idea of angles with the word I see.)" Observer A., R.T. 2035, prot. 28.

THE FIFTH SABOM IS NOT (rabbit-like). Introspection: "When I saw the stimulus I had at once knowledge that this SABOM is different from the others, especially from the first. There was vague knowledge that there was another SABOM which is similarly peculiar in shape. I did not get the image of the fifth but a knowledge of its colour and its difference of shape. There was an intentional direction towards the place of the first and knowledge of its rabbit-like shape. There was another mental movement back towards the fifth, and I looked once more at the stimulus and stressed 'not.' I did not try to get any further knowledge or image of it, but only waited passively being sure of its difference from the first. The word 'rabbit-like' was kinaesthetically read off." Observer D., R.T. 6322, prot. 122.

THE SECOND BOGIL IS (pink). Introspection: "I knew at once on reading this that the second BOGIL was like the first but of different colour. There was a tendency to assent to that as judgment, but I felt compelled to add to the judgment something about the colour of the second BOGIL. Then two distinct visual images developed: the second BOGIL coloured red then the second BOGIL coloured pink. I seemed to make a choice between them for the second place. I could not decide. Then another picture of the fifth BOGIL—

pink in its right position developed and immediately with the very rapid intentional direction towards the left with no other images at all, except with that kinaesthetic image of the movement, I said the words: 'is pink.'" Observer B., R.T. 5002, prot. 25.

THE FIRST MEVOZ IS (brown). Introspection: "I read the stimulus and immediately there was clear visual image of the first MEVOZ. It was so clear that I saw the little ear on the right hand side on the top. Then I said: 'first MEVOZ is brown.' No consciousness of any other MEVOZ or of any general scheme." Observer A., R.T. 1665, prot. 27.

ALL SABOM ARE (tree-like). Introspection: "Understood stimulus. Attention centred on SABOM and the 'all' became marginal. The experience was rather like shutting down of an iris diaphragm. The meaning was absolutely general and fairly determinate: 'SABOM is a root-like thing.' Reacted auditory-kinaesthetically 'tree-like.' Accepted with certainty." Observer E., R.T. 980, prot. 81.

ALL SABOM ARE (blobby). Introspection: "When I saw these words an image of the green SABOM developed clearly and fragments of others: first and fifth came, then the words: 'all SABOM are difficult' came. There was a tendency to accept that with the knowledge that it was part of my general meaning of SABOM. Then with a very quick swing of attention, and with green SABOM image before me I substituted: 'all SABOM are blobby.'" Observer B., R.T. 8623, prot. 24.

NO LUMIG IS (green). Introspection: "Very calm at the warning and at the exposure, surprised though to see new set of words but not affected emotionally. Then my consciousness was occupied by a knowledge of three sharp angles, but I thought I can't make any judgment of that, so I tried to get away from that idea. Then spontaneously the judgment came: 'no LUMIG is green' and I had a feeling that that was correct and gave the signal (then I recalled LUMIGS one after another and found that no one was green)." Observer A., R.T. 9586, Prot. 7.

ALL PETUL ARE (humped). Introspection: "...then there was a blank and I was making very strong efforts to complete this sentence with some word by trying to find some general characteristic common to all PETULS. Several came one after another into consciousness as many images and I thought of saying: 'they are leaf-like' and one came to consciousness that was not anything like a leaf. I was feeling desperate and then suddenly thought of the word 'humped' and said mentally: 'all PETUL are humped,' and gave the signal. As I gave it I was surprised that this thought had not come before because that was the way I had always distinguished them." Observer A., R.T. 5730, prot. 5.

PETUL IS (leaf-like). Introspection: "Considerable consciousness of action in striving to get the meaning of PETUL clear. Then in three pulses: 'PETUL is leaf-like.' This was universal or rather it was abstract. There seems to be no activity in reading off predicate. The meaning of predicate seems to come out of the meaning of subject." Observer E., R.T. 1421, prot. 88.

DIPUV IS ("Y"-shaped). Introspection: "Read stimulus auditory-kinaesthetically. Knowledge that DIPUV was 'y'-shaped figure. No particular one was intended. There was no explicit thought of universalising it. It was surely an abstract meaning of the nonsense word. Reacted: 'y'-shaped auditory-kinaesthetically. No effort, no conation." Observer E., R.T. 646, prot. 99.

PETUL IS (humped). Introspection: "I read the stimulus. There was the

same impression as before, i.e. that the card was *much whiter* than usual. Then a short blank, then the first PETUL came as visual image. I thought 'it is shaped like a lily,' but I felt that didn't apply to all PETULS. So I had a good deal of striving to get something general to PETUL. Then I remembered that they were all 'humped' in some way. Gave that judgment: 'PETUL is humped.' (There was no temptation to look at this stimulus as calling for a particular kind of judgment. I looked at it at once as if there were: 'ALL PETUL ARE —'). Observer A., R.T. 972, prot. 89.

ALL DIPUV ARE (like leaves). Introspection: "I read the word 'all' and had a feeling: 'this is an easy judgment.' When I read the word DIPUV there was an imageless knowledge of the general character of the shape and after that several vague and fleeting images of individuals. I felt I knew what all DIPUV were in an imageless way but I felt that I ought to make some characteristics explicit. Several images then tended to develop more clearly and the words: 'like leaves' were explicitly (auditorily) present. I reacted to that with the feeling of satisfaction and completeness." Observer B., R.T. 2727, prot. 9.

NO SABOM IS (round). Introspection: "There was a little tension in the fore-period. I read the stimulus. Then there was a little start of surprise. Then a blank. Then I seemed to have been trying to find an adjective; and none came. Then I had a knowledge of two arms which entered into my general scheme for SABOM. Then I said: 'no SABOM is round.' I felt satisfied." Observer A., R.T. 2135, prot. 10.

ACTIVITIES AROUSED BY THE TASK IN THE COMPLETION OF THE SENTENCES.

The knowledge, which was acquired by our observers during the learning period, and which was at their disposal in the "completion experiments," represented a more or less organised whole. The meanings of the pictures of each set formed a related group for themselves, all the sets thus forming a system of items divided into seven groups. Every observer had such an orderly system of knowledge (no matter whether he had formed general concepts of the sets or not), and different items had for him definite places in that system. Moreover, the observers knew the numbers of the respective pictures in each set, and these numbers (for so they were learned), ran from the left to the right hand side of the series. The relations deduced from the characters of the different pictures of a set (shapes, positions, colours, etc.) had already cemented a strong coherence between the group members. The spatial relations on the other hand (place in the group, etc.) also helped a great deal in the formation of a "schematic" order among the known items. These spatial relations proved to be very useful for the identification of "individuals" within such systems. For some observers—and for one at least quite explicitly—even the sets had some numerical order in the whole system

(total). PIMEF meant thus from this point of view the first group, DIPUV the second and so on¹.

The activity experienced by our observers in making the judgment must be accounted for by the fact that they had accepted the "general" instruction *voluntarily* before the stimulus appeared. All the conational phenomena (experienced and reported mostly in determining the meaning of the subject) recorded in our experiments, thus show essentially the same features as the phenomena observed by other investigators who have dealt with the question of the *task, end, purpose or direction* of mental processes either in the domain of thought or that of voluntary action. If there are any differences, they are of a secondary character. In Watt's work², for example, and in the works of other investigators who employed "controlled association" as method, the task was explicitly given more determinately and univocally beforehand. The observers had to react to an exposed word with a superordinate or subordinate idea, or the like. In the experiments of Ach who was concerned in his first work³ more with voluntary action than thought processes, and in his second work tried to find a quantitative equivalent of volition, the observers had also a determined and specified task before the stimulus was exposed. In the experiments of his second work⁴ they had to perform an action to which a strong habit was opposed. They were instructed, for example, to react with a rhyme to a nonsense syllable which had been in learning previously associated with some other nonsense syllable. With regard to our experiments the task implied in the instruction given to our observers became determined or specified only when the stimulus was exposed. This only could give a definite direction to the activity aroused by the instruction given beforehand. It was further characteristic of the stimuli employed in our experiments that these consisted of two parts which directed the activity conjointly and nevertheless each for itself, so that this directing of the activity may be regarded as a "combined" one. The word

¹ The numbers must not be taken in their literal sense, but there was present somehow or other some "schematic" sequence of the sets. These were rarely referred to as numbered; they were *intended* rather as e.g. the "last," "last but one" and the like, the words being the only available expression for the "intention" in question. The same holds good for the individual pictures, although in this case the numbers, being associated in learning, were more frequently used.

² Watt, H. J., "Experimentelle Beiträge zu einer Theorie des Denkens," *Archiv für die gesamte Psychologie*, 4. Bd. 1905.

³ Ach, N., *Ueber die Willensfähigkeit und das Denken*, Göttingen, 1905.

⁴ Ach, N., *Ueber den Willensakt und das Temperament*, Leipzig, 1910.

qualifying or quantifying the subject of the judgment was one part and the name or subject of the part-sentence another. Thus the prefixes "no," "all," "some" and different numerals, and the suffix "not" may be likened to the instruction given beforehand in the "controlled association" experiments, i.e. to react with a subordinate or co-ordinate or superordinate idea, or to find a "part," a "whole" and the like. All these words used in our judgments expressed some relation within which the subject had to be determined and a predicate asserted—or denied—of it. Their function was thus to direct the observers' activity towards different "spheres" interrelated within the whole system of knowledge for our material.

They corresponded in their function to the "anticipating schemata" of Selz¹. The difference here again lies in this that our prefixes were parts of the stimulus, and not being given beforehand, they were not strictly speaking "anticipating relations" in a temporal sense, i.e. given in the fore period of the experiment. But once they were exposed, they controlled the course of the mental processes in exactly the same way as if they had been given beforehand.

They "drop out" of consciousness² and do not appear any longer during its course, unless some difficulty or obstruction in the solution of the task arises. In short, they behave as do the Aufgaben of Külpe and Watt or as the idea of end (Zielvorstellung) of Ach, which sets up the Determining Tendencies³.

That the prefixes behave in the same way as if they had been given in the instruction beforehand may be seen from the protocols of the experiments. When the stimulus is being apprehended, the name is usually prominent, the prefix word being only on the "margin" of consciousness. In those cases in which both were apprehended with equal explicitness, the latter soon drops out of consciousness. The extracts from our protocols recording these facts are as follows:

¹ "antizipierende Schemata"; cf. Selz, O., *Ueber die Gesetze des geordneten Denkverlaufes*, Stuttgart, 1913; also *Zur Psychologie des produktiven Denkens und des Irrtums*, Bonn, 1922.

² "Diese im Unbewussten wirkenden, von der Bedeutung der Zielvorstellung ausgehenden, auf die kommende Bezugsvorstellung gerichteten Einstellungen, welche ein spontanes Auftreten der determinierten Vorstellung nach sich ziehen, bezeichnen wir als determinierende Tendenzen." Ach, N., *Ueber die Willenstätigkeit und das Denken*, Göttingen, 1905, p. 228.

³ "Unter den determinierenden Tendenzen sind Wirkungen zu verstehen, welche von einem eigenartigen Vorstellungsinhalte der Zielvorstellung ausgehen und eine Determinierung im Sinne oder gemäss der Bedeutung dieser Zielvorstellung nach sich ziehen." Ach, N., *Ibid.* p. 187.

THE FIRST MEVOZ IS ("that particular picture" (intended)). Introspection: "I read stimulus. The word 'first' dropped out of consciousness...."

(Note: "The word 'first' once its meaning is grasped seems to drop out of consciousness while MEVOZ was being thought, but since it determined the reaction correctly, it apparently acted like a Determining Tendency.") Observer E., prot. 27.

NO SABOM IS (black). Introspection: "I understood at once the whole stimulus, but 'no' quickly dropped out of consciousness, so that 'SABOM' only persisted clearly...." Observer D., prot. 10.

ALL DIPUV ARE (small). Introspection: "...I saw the sentence. The DIPUV was more prominent...." Observer A., prot. 9.

NO LUMIG IS (humped). Introspection: "When I saw the stimulus I was conscious at once that it was negative, 'no' being prominent. I had then knowledge of the general meaning of LUMIG, a vague schematic colourless image being present. No particular figure was intended.... Prefix 'no' dropped soon out of consciousness, while there was an intentional direction towards 'something else....'" Observer D., prot. 112.

ALL SABOM ARE (tree-like). Introspection: "Understood stimulus. Attention centred on SABOM, and the 'all' became marginal...." Observer E., prot. 81.

NO DIPUV IS (like a cat). Introspection: "Got meaning, 'no' marginal...." Observer E., prot. 44.

Not only the prefix words as part of the task drop out of consciousness, but the whole part-sentence may do so, when it has once been apprehended, without losing its function of determining the activity. Observer A., for example, gives at the end of one of his introspections a general note as follows: "I get an idea of the stimulus words and I don't think any more of them" (Prot. 19); and another note: "I don't think of PETUL or MEVOZ or whatever the name may be, but I think what I am wanted" (Prot. 79). We can understand what he means by "I think what I am wanted" when we refer to the "spheres" of the system of knowledge for our material. His "idea of the stimulus words" means the same—i.e. reference to different "spheres." The prefix word which in itself means a relation, as a part of the stimulus meant a relation—directing or controlling the activity. The name or subject for its own part means in this respect an activity towards the place or group related in the system of knowledge. In the same fashion "all" may mean (especially if the general concept has not been already fixed in learning), "a sweep of attention over the whole series," the words "first" and "second" mean direction to the left, "fourth" and "fifth" direction towards the right and so on.

The task when it has once dropped out of consciousness tends to appear again whenever there is any difficulty or obstruction opposed

to its solution¹. We have previously seen that the general character of the sets tends to appear as preceding other items of knowledge whatever kind of judgment may be presented for completion². Further, we have pointed out that the name in the part-sentences tends to be prominent during the perception of the stimulus. This often brings about a revival of the general character first. Now, if the task is to complete a Particular Affirmative Judgment, and if the general character happens to appear first, there is a tendency for the task to reappear at once in consciousness. The same phenomenon occurs in any kind of judgment whenever an item appears that is not wanted. Some examples from our protocols illustrating this point are as follows:

ALL PIMEF ARE (squiggly). Introspection: "Read stimulus. Difficulty in getting the meaning of PIMEF. Then awareness of shape of first PIMEF and of second, one after the other. Prominence of '*all*.' Distinct effort to recall third, fourth and fifth. No success. Consciousness of action here. I interpreted *all* to be collective...." Observer E., prot. 58.

SOME PETUL ARE (green). Introspection: "...I saw the stimulus, then there was blank. In an effort to find an adjective for the sentence I recalled the general shape of PETUL (my schematic shape) and then thought: '*that is not good, because it applied to all PETULS.*' Then...." Observer A., prot. 26.

SOME LUMIG ARE (grey). Introspection: "When I saw the stimulus I immediately had my general scheme for LUMIGS in consciousness and I thought, '*that is no good, because I must get something that does not pertain to all the LUMIGS.*' Then I thought: '*I'll find some colour which is common to more than one.*' I remembered...." Observer A., prot. 49.

SOME LUMIG ARE (brown). Introspection. "When I saw the stimulus I recognised it as particular one. I had the general meaning of LUMIG represented by a schematic image, colourless and applicable to any individual of LUMIG. '*Some*' became again *prominent with consciousness* that it will be difficult to *particularise* in this set. I started a sort of review...." Observer D., prot. 105.

The reappearance of the task occurs in a more prominent way when the part-sentence exhibited for completion is novel or when the observer is in doubt about it. In these cases the task not only reappears in consciousness, but there may also occur a special voluntary act by which the observer adopts an attitude as to how to interpret it. This happened several times in our experiments when the General Judgment was presented for completion for the first time. There was then often an explicit decision how to regard it. There are many cases in our experiments in which voluntary acts occurred, some in predicating and some before the meaning of the subject was determined. They usually concerned the adoption of

¹ Cf. Ach, Michotte, etc.

² Cf. data concerning phenomenal aspect of the meaning of subject.

an attitude with regard either to the plan of work or method of solution of the task or to the predication itself. We here present only a few extracts from our protocols showing the reappearance of the task when this was a new one or when the observer was in doubt concerning it.

PIMEF IS (five-lobed). Introspection: "I was very puzzled when stimulus appeared. There was no meaning of PIMEF except the meaning of the word as word of experiment. Then thought came with some words: 'I was to give the general meaning, that is what is wanted'...." Observer B., prot. 71.

LUMIG IS (cusped). Introspection: "Anticipated LUMIG in fore period. But when I saw stimulus I was struck by its form: 'LUMIG is' and with consciousness of action adopted an attitude to respond by applying a predicate to an abstract LUMIG...." Observer E., prot. 90.

BOGIL IS (flower-like). Introspection: "I read the stimulus and then there was a little surprise. It seemed somehow kind of naked (and bare). I looked at it again, saw only two words of it and thought: 'this is neither a universal nor a particular judgment.' But I decided to make it universal...." Observer A., prot. 81.

The observers are sometimes conscious that activity conditioned by the instruction and discharged by the stimulus is working as a tendency towards the required solution. They know that something is bound to come, that there is something waiting ready as response to the task. Or they know that something ought to have come. This phenomenon has been observed by Ach, Messer, Koffka and others¹. Some of the cases in our experiments in which this "awareness of tendency" occurs, concern the completions which had been already once performed or in which the meaning is easy to obtain. Examples from the protocols are:

THE FIFTH PETUL IS ("Yes" to a clear and definite knowledge). Introspection: "I knew that I knew PETUL. Understood the stimulus with considerable mental activity. Made an intentional direction towards the right, a sort of mental swing. Paused actively and let this fifth PETUL develop. I knew *it was there*, though it was not in any sense clearly present. But it developed progressively in determinateness, until it was quite definite enough for reaction...." Observer E., prot. 37.

ALL BOGIL ARE (flower-like). Introspection: "As soon as I perceived the stimulus and recognised its meaning I knew that I could complete it very easily. There was a feeling that there was a word just waiting to complete this sentence, so I waited very leisurely...." Observer A., prot. 109.

The same stimulus repeated. Introspection: "(This was very quick and easy reaction). I saw the stimulus. Then there was very brief blank, during which it seemed that there was an idea just ready to come into consciousness when I wanted. I had no knowledge what that idea was but I felt that it would satisfy the condition of experiment...." Observer A., prot. 130.

¹ See Lindworsky, F., *Der Wille*, Leipzig, 1923, p. 70.

Lindworsky explains this "awareness of tendency" by the fact that the process of reproduction can be noticed (observed) before the idea becomes clearly present in consciousness¹. He refers to Bühler's observation that an idea may be given (present) indirectly by its determination of place or its relations to other items². He refers still further to the "scheme" appearing before the contents themselves appear in consciousness (Selz). We have also indicated that the knowledge of our material represented a related system of items, and the activity aroused by the task and involved in determining these items was directed towards different "spheres" of this system (groups, places of "individuals," relations between the characters, and so on). In agreement with Selz's theory, these "spheres" were schematically anticipated, before the required items were reached. This anticipation, however, did not occur in the fore period of our experiments as the relations were not given before the stimulus appeared.

COMPARISON OF ASSOCIATIVE REPRODUCTIVE TENDENCIES AND RELATIONALLY "DIRECTED ACTIVITY."

We have not so far mentioned anything about reproductive associative tendencies which played a very large part in the completion of our sentences. We wish now to point out an apparent difference between associative reproduction and guided or directed reproduction³ as they presented themselves in our "completion experiments."

There was a tendency with three of our observers (A., B. and C.) in most cases to start the processes involved in the completion of the sentences with associative reproduction of a character. With two observers (A. and B.) this was almost a rule. It was mentioned in the first part of this work that observer A. had a very good memory for colours. In reactions to meanings, for example, during the learning period, it was noticed that he always started the chain of reproductive processes with the colour as a character. Observer B. was noted previously as very frequently making use of verbal associations during the learning period. It was further pointed out that he had

¹ "Zum Verständnis dieser wichtigen Erscheinungen sei zunächst daran erinnert, dass sich der Vorgang der Reproduktion bemerklich machen kann, bevor noch die Vorstellung deutlich bewusst wird." Lindworsky, F., *op. cit.* Leipzig, 1923, p. 70.

² "Weiterhin kann die auftauchende Vorstellung indirekt durch ihre Platzbestimmtheit oder ihre Beziehungen zu anderen Inhalten gegeben sein." *Op. cit.* p. 71.

³ Directed, i.e. by relations. Mere association also might be said to be "guided," but not in the sense used here.

difficulty in forming the general meaning in one set since he was not able to abandon the associations formed in the learning of the first picture of that set ("rabbit" in SABOM set). It was also noted that observer C. was inclined to interpret most pictures on the basis of the associates aroused by them and also for his difficulty to form general meanings for most of the sets. In the "completion experiments" observers A. and B. rarely if ever started their mental processes with any relational direction when they had read the stimulus. Observer C. although he does not mention "intentional direction" (as he is unfamiliar with the expression), sometimes mentions "reference" or uses some other expression which suggests a direction of activity at the beginning of the experiment. Observers A. and B. were familiar with the phenomenon of "directed activity," and they frequently reported it, but rarely as an initial moment of the process of completion. The exception in this respect was when they could not obtain any character at first. The other two of the five observers (D. and E.) almost invariably began with being active in one or other direction except in the cases in which the task was very easy or the response came as a habitual one.

It is important to note that the observers who always started with a non-directed reproduction (whether the items came spontaneously or by a non-directed effort) showed a tendency to revert at once to a *verification* of the obtained item, whereas the observers who habitually started *with relations* do not employ any verification in satisfying themselves with regard to certainty¹. On the other hand, they also apply verification whenever the item comes immediately by mere reproduction (without the mediation of any relating) after the perception of the stimulus. We may thus generalise the fact for all observers that *whenever an item comes to awareness by a non-relationally directional reproduction it needs verification*²; *the items that come as result of a "relationally directed activity,"*³ *do not need such verification*⁴. The fact that the items require verification (which is

¹ This marks the noegenetic character of the process in question, as compared with the merely reproductive character of what we have called non-directed activity.

² When we say "verification" we abstract from "acceptance" of the predicate as being true, although these two are logically connected as means and end.

Under "directed activity" we mean activity controlled by relations ("scheme" system, spheres or any relation of characters).

These two statements hold good when the items of relatively equal determinateness are compared as reached in two different ways. There are, however, cases in which there is no need for verification no matter whether the items have been obtained in one or the other way, for example, those of very familiar or habitually appearing items.

nothing else but eduction of relations) in the first case, and in the second require none (but come by means of relations) is proof that in whatever way they come their adequate determination depends on awareness of relations. Thus all the observers *use* relations as means of determination: the only difference is that some observers use them in an anticipatory way in order to obtain the required item, whereas the others use them to verify items already obtained. Observers A., B. and C. also report frequently "directed activity" but not as an initial process in reproducing. On the other hand observers D. and E. who usually start the chain of reproduction with a "direction" do not do so in all those individual judgments the subjects of which denote the pictures which are loosely connected with the set. In discussing the points with regard to the formation of the general meaning we have seen that these "individuals" remained "split off" from the rest of the set without losing their original associations which were formed while they were being spontaneously interpreted. (The absence of the direction of activity in determination of the meanings of these pictures and their predicating was thus due to their being only loosely related to the system in question.)

We may explain the absence of verification in the cases in which the items come as the result of a "direction of activity" by Koffka's phenomenon of "intentionality." He thinks that one of the effects of the Determining Tendency is the intentionality which consists in this that the ideas, which appear as the result of a Determining Tendency, are not only simply experienced but are experienced as being due (corresponding) to the Determining Tendency¹. We are to explain, then, the necessity of verifying an item, if this does not come as the result of a "directed activity" by the lack of "intentionality" of which mention is also made by Koffka². Lindworsky thinks that he has explained away "intentionality" as one of the characteristics of the Determining Tendency. According to him, the task perseverates (Müller) in consciousness or is being recalled and thus serves as the standard for its solution³. For Koffka the phenomenon

¹ "...die Intentionalität der Reaktionsvorstellung, die darin besteht, dass die Vorstellungen, die infolge einer det. T. auftreten, nicht eben nur einfach im Bewusstsein sind, sondern auch als der det. T. entsprechende bewusst werden." Koffka, K., *Zur Analyse der Vorstellungen und ihrer Gesetze*, Leipzig, 1912, p. 311. Quoted by Lindworsky, J., *Der Wille*, Leipzig, 1923, p. 55.

² "Das Fehlen der Intentionalität ist ein Merkmal der nicht einer det. T. entsprechenden Vorstellung." *Ibid.* p. 313.

³ *Ibid.* p. 68.

of intentionality is a further proof of the Determining Tendency; and we think that the facts from our research pointed out in the foregoing support his view indirectly with this reserve that intentionality need not always be consciously present. To that extent we also agree with Lindworsky. But we do not agree with his statement that consciousness of intentionality is due to the presence of the task at that moment, so that the induced idea is being compared with it as with a standard. We may be quite aware that our solution of the task is good, without the task itself being present in consciousness at all, and it is a known fact that even if there were any comparison between a standard and an item there is no need for the first to persist in consciousness in order that a comparison should be made. But we do not maintain that intentionality was reported in our experiments when the items due to a "directed activity" came into consciousness, although in some cases such a phenomenon was reported. Our point here is that the absence of verification was conspicuous in the cases in which the items obtained were the result of a "directed activity," and this fact may be regarded as an indirect proof of the Determining Tendency. But apart from the question as to whether the Determining Tendency as well as intentionality is to be theoretically accepted, the cases in our experiments¹ can be explained from the point of view of cognition by Spearman's third noegenetic principle. In "controlled association" experiments, for example, the solutions represent cognitively the process of education plus reproduction of correlates. The task represents a relation, the stimulus one correlate and the solution the other (educated and reproduced). In our experiments, the determined or specified task being implied in the stimulus, this represents both relation and one correlate, and the solution is education plus reproduction of the other correlate. From a dynamic point of view the relation as part of the task is an "active" or controlling relation and guides the reproduction of the required item. When the observer reaches this by going through all the relations that lead to it, it is obvious that this does not need any verification. Verification always consists in applying relations, and these have already been lived through before the item has been attained. Insight that everything is all right is enough². If the item comes spontaneously or if it has been obtained

¹ Our experiments by the way did not deal with the same task as Koffka's experiments and for that reason can support his view only indirectly and from another point of view.

² The consciousness that the solution is correct is what Lindworsky probably means by

by a non-directional effort of recalling, the observer reverts to a verification either under the influence of the subjective task¹ (observer A. always has it) or because of the lack of insight due to the lack of relation. Only then the observer starts with relations and goes through the whole procedure through which the other type of observer has already gone.

In order to illustrate the difference between the two ways of completion as discussed in the foregoing paragraphs we present introspections of all the five observers. For better comparison and in order to have samples at random we take any three judgments but the same three for all observers.

Observers A. and B., as stated before, represent opposite types to observers D. and E. The first two obtain at first the required item and then try to verify it, by relating it to others. D. and E. go from general or system and reach the item through relations without finally verifying it. C. represents a transitional type between the two. As all examples are taken at random they may not represent quite clear cut types. Further, in some examples it will be seen that the "individual" pictures could not be adequately determined but the process of their determination, such as it was, is clear. (PIMEF and SABOM represent the most difficult sets.)

I.

Observer A.², prot. 21. THE SECOND LUMIG IS (brown)³. Introspection: "Before, I used to see nonsense word with great clearness, now I focussed primarily on the first word of the stimulus. So when I saw 'the second LUMIG' there was an *immediate consciousness* of a *brown* LUMIG and I had pretty clear knowledge of a shape. Then I *doubted* because the shape was very much *like* the first LUMIG and I thought: 'the first and second LUMIG would not be so much *alike in shape*.' Then there was a vague consciousness of a blue LUMIG and I thought that is further away in the series. I could not get any more definite meaning, so I reacted: 'the second LUMIG is brown.' I am not sure that it is." R.T. 2447.

the consciousness of fulfilment ("Erfüllungsbewusstsein," *op. cit.* p. 68) to which he refers in explaining away "intentionality." But again, that consciousness may be simply an insight without any comparison with the task being necessary.

¹ There is a tendency for observers to mistrust the spontaneous appearance of an item, which is an indication of the subjective task. This indicates also that without relations there is not much certainty.

² For easier comparison the introspections are presented in three groups and in such manner that the first three protocols for the same judgments illustrate the behaviour of the observers (A., B. and C.) who obtain at first an item and then verify it, whereas the last two protocols of each group belong to observers D. and E. who always proceed from system or relations.

³ False.

Observer B., prot. 21. THE SECOND LUMIG IS (blue (image obtained)). Introspection: "I read the words 'second LUMIG is' and the word 'blue' came. I did not feel quite *certain* as to whether I could assent to this. Then the blue LUMIG developed as an image. I tried to *fit it* in its *place* after a brownish one. It seemed to fit, then the image and the stimulus *vanished* from consciousness and I was left just with the feeling that *everything was right*. I reacted. (I felt I made judgment.)" R.T. 1838.

Observer C., prot. 21. THE SECOND LUMIG IS (blue). Introspection: "Read 'the second LUMIG is.' Pause. I then became aware of a *blue picture* and had the knowledge of its shape. I could not determine its number, but knew it is *in the beginning*. Then a knowledge of *another* picture which was brown came. *These two seemed to fluctuate*. I read 'the second LUMIG is'—again. Then I knew that one of these two pictures was the second. I made an effort to determine which is right. I decided that the blue one is the second and read: 'the second LUMIG is'—followed by knowledge of the blue picture. (After this doubt, after reaction, thought that it was right.)" R.T. 1579.

Observer D., prot. 21. THE SECOND LUMIG IS (blue). Introspection: "As soon as I saw 'the second LUMIG is' I knew *what LUMIG meant*. There was then an intentional *direction towards the beginning of the series*. I got at first a vague brown image of the first LUMIG and then had a thought that the *second is reversed* in position to it. *Then came a blue* image of the second LUMIG, blue colour being more knowledge than a sensory element of the image. 'Blue' (auditory-kinaesthetically) was so strong in consciousness that I was tempted to pronounce it. With a strong tension I tried to get (choose) something else and the blue image appeared again now being very clear. After examination of it I could not find anything else to say and completed the sentence with 'blue.'" R.T. 5721.

Observer E., prot. 21. THE SECOND LUMIG IS (squiggly). Introspection: "The meaning of LUMIG (*general*) came fairly easily, but I was unable to determine the *second LUMIG*. Some activity in attempting to do so. Then a belief that I could not determine it. Then auditory-kinaesthetically: 'I know that *all LUMIGS* are squiggly.' Accepted squiggly, which really had the meaning 'like fleur-de-lis' as being true of the second since it was known to be true of all. This was rather a collective meaning at first, then a universal one. Knowledge that the reaction was taking time and feeling of waiting." R.T. 5114.

II.

Observer A., prot. 29. THE FOURTH PIMEF IS (green)¹. Introspection: "When I saw the stimulus I *completed it immediately by the word 'green'*—mentally. Then I tried to recall green PIMEF which I did very distinctly. I tried to *determine* the green PIMEF's place in the series and I *was not sure* that it was fourth. But I could not remember any other PIMEF so I had no way of localising it and I gave the mental response: 'the fourth PIMEF is green.'" R.T. 1025.

Observer B., prot. 29. THE FOURTH PIMEF IS (pink (image))¹. Introspection: "As soon as I saw the words a *pink image* of definite shape appeared. I *tried to fit this into its place* (fourth) before a green one (fifth). It seemed to fit there and I accepted that as my judgment *not feeling quite satisfied*." R.T. 4666.

¹ False.

Observer C., prot. 29. THE FOURTH PIMEF IS (pink). Introspection: "I found it rather difficult to focus my attention on the task because of distraction. I read 'fourth PIMEF is' and knew PIMEF *series immediately*. There was reference to the number and I had an image of a rose pink picture. There was thought present: 'that is the fourth' (no words). Pause. *Tried to confirm* this. There was a vague knowledge of some other picture although its position in the series was not known. I felt that I could not recall that last picture of the series without an effort and I decided to react on the pink picture and did so. I read 'the fourth PIMEF is'—knowledge and image completing the sentence." R.T. 1206.

Observer D., prot. 29. THE FOURTH PIMEF IS (brownish). Introspection: "When I saw 'the fourth PIMEF is' there was a rather long pause before there was a *direction of attention towards the end of the PIMEF series*. (Pause was caused I think by my thinking of number 'four' which was mentioned before experiment in connection with some other picture.) I had then only intentionally the last PIMEF. Then I was aware of the *general shape of the last three PIMEFS* which form for me collectively a *class* for themselves. Soon after that I had a brown image of the fourth PIMEF and after a while as I thought what to choose for response I said aloud 'is brownish,' image being still present." R.T. 4490.

Observer E., prot. 29. THE FOURTH PRIMEF IS (one of those three). Introspection: "Read 'the fourth.' Feeling that there would be difficulty. Read 'PIMEF.' Meaning arose as P—F¹. Feeling of difficulty. Then a knowledge that the *fourth PIMEF was one of the class 'three similar ones,'* i.e. third, fourth and fifth, and I reacted with the meaning that it had characters of that subclass of PIMEFS. Reaction words were auditory-kinaesthetically: 'one of those three.' The meaning was limited to one of the three but by a determination from an abstract meaning to them and to any other." R.T. 4714.

III.

Observer A., prot. 38. THE FOURTH SABOM IS (red)². Introspection: "(During the fore period I was disturbed by somebody in the next room, it seemed, a long time before the warning signal. Some physiological change at the warning but not pronounced.) I read the stimulus and had an *immediate* consciousness of a *red* figure with two big projections on the upper side. Felt that it was SABOM, then *doubted* whether the red SABOM was not fifth. Then I had a knowledge of a lavender figure which I thought was the fifth and I felt sure that the red one was the fourth and made that judgment though not with absolute certainty." R.T. 2072.

Observer B., prot. 38. THE FOURTH SABOM IS (green). Introspection: "*As soon as I read this I had a quite clear image (green) I felt certain this is the fourth SABOM, but I felt I had no ground for this certainty.* No other images or knowledge developed at all and I felt quite impelled to react to the one that was before me as an image. I felt that the whole process was irrational. (It almost seemed as an ordinary reaction, not as if I had really made any judgment.)" R.T. 3095.

¹ P—F (pee—ef) was the mnemonic means employed by observer A. in learning this series. Its revival this time was undoubtedly due to the difficulty reported. PIMEF was the most difficult series for this observer.

² False.

Observer C., prot. 38. THE FOURTH SABOM IS (green). Introspection: "I read, 'the fourth SABOM is.' I felt that I did not know this one very well. There was also a vague thought I shall have to make an effort. I had a vague image of a picture, which I knew to be one of the series (last one). There was then a vague knowledge that another of the pictures was bright red. This seemed to give rise to probability of another picture being green. Then I had an image which I recognised as belonging to the series. There was knowledge that it is green. I thought 'this is the fourth one.' I seemed to be unable to confirm this and although there was some doubt present I reacted: 'the fourth SABOM is green.' (The doubt disappeared after reaction and there was thought 'it must be the fourth.')" R.T. 3035.

Observer D., prot. 38. THE FOURTH SABOM IS (green). Introspection: "As soon as I saw 'the fourth SABOM is' I knew that this series is a difficult one in particularising. After a short pause, there was a direction of attention towards the end of the series. I had a vague image and a clear knowledge of the last SABOM. Then my attention swung to the beginning of the series, quite determined voluntarily. I got the image of the first SABOM and then there stood a 'gap' between the image of the first and the intentional knowledge of the last. There was present a knowledge of the difference between them and of the fact that the last one represented the most of them. I tried to visualise a picture similar to the last. After a short pause I got a deep green image indefinite in shape (and confused with green MEVOZ as I know now). I recognised it as correct and said 'is green.'" R.T. 6911.

Observer E., prot. 38. THE FOURTH SABOM IS (small). Introspection: "Read stimulus auditory-kinaesthetically. Meaning 'fourth' was accepted. Abstract meaning of SABOM arose with a knowledge of the first and second and very vaguely of the others. Knowledge that it was the root-like figure. I think there were auditory images of 'root-like.' A memory knowledge that the last two SABOMS were small relatively to the others and a knowledge equivalent to: 'Well, if that is so, the fourth must be small.' Word 'small' auditory-kinaesthetically. Reacted." R.T. 2148.

PREDICATION.

Individual Affirmative Judgments.

The protocols quoted in the last chapter show how different observers completed the part-sentences in which the subject signified an individual picture. We shall now treat the completions of the part-sentences as completions of part judgments, and in this paragraph we shall deal with Individual Judgments¹. Whatever differ-

¹ Neither of the terms "judgment" or "predicate" was ever mentioned in the instruction given to our observers. Our purpose was to produce conditions in which judgments would be made as they are traditionally conceived, without asking the observers actually to make them. But it is unnecessary to add that they guessed from the nature of the task and the stimuli given that the experiments had to do with judgments. One observer only knew the purpose and the plan of the experiments beforehand. Another observer, C., was quite ignorant as regards both purpose and plan. He was quite a "layman" in respect of this kind of research; and indeed with regard to its subject-matter. Although a very

ences in the examples already quoted may be, the observers did not accept a predicate until they had adequately determined the meaning of the subject (except in the cases in which practice had mechanised the procedure). This determination of the subject was not always complete, but there was always an attempt to make it as complete as possible. In all the instances quoted the predication was characterised by different degrees of "truth" which ranged from absolute certainty, through belief, to complete uncertainty. *The grounds for certainty were mostly the relations educed between the item obtained and other items which were members of the same system of knowledge.* The individual differences between the observers already discussed have nothing to do with these grounds of "evidence" necessary for the acceptance of the predicate, but only with the sequence of mental processes by means of which it was reached. While A. and B. invariably obtained an item, which from our present point of view may be regarded as a tentative predicate, and then verified it before finally pronouncing it, D. and E. proceeded mostly from the system, scheme, or sub-class—in short from the relations—finding in these grounds for the acceptance of a predicate, in an anticipatory way. Observer C. used both methods according to the circumstances. There are slight differences to be seen even between the two observers of the first "non-directional" or "verification" type. While A. uses all kinds of relations in his "verification," B. employs the spatial relations within which the individuals were distributed in their respective series rather than the relations between their essential characters. This observer thus applied a kind of "verification" which was specific to him and which consisted in "fitting." Such "fitting" primarily concerned the places of the different "individuals" in their "schematic" order. This observer often finds the criterion that an obtained character belongs truly to the subject, i.e. known picture, in the knowledge that a foregoing or subsequent item possesses a character which is related to the tentatively suggested one as another member of the same system or order. If this "individual" to which a predicate is thus tentatively applied "fits" into the order as known by the observer, the predicate is then accepted as true. This observer indeed states often explicitly that he regarded this

good observer, he had never studied Psychology in an academic sense and the experimenter is quite certain that he did not know anything about Logic at all. He never mentions the word "judgment" in his protocols nor does he know what a "subject" or a "predicate" of a judgment is. It may be interesting to mention also that of all the five observers only three were supposed to have studied Logic.

"fitting" as his judgment¹. Thus, many of his Individual Judgments consist in "fitting." This is the reason why the predicate is rarely pronounced in the final act of judgment by him, although it is often pronounced tentatively at the beginning. This is also the reason why many of his Individual Judgments are no more than "identifications," demonstrative or indicative judgments. A further effect of this is that his predication sometimes consisted in an assent to the "suggested" character, especially where there was no "verification" necessary. Finally, the obtained items, as response to the task, appear as images more frequently with this observer than with any other. If we take this in connection with the fact that many of his judgments are mere "indications" and "identifications," it may be concluded that most of them were judgments on a "perceptual" level.

Once the meaning of the subject in the Individual Judgments has been determined, the predication consists for all the observers (except in a few cases for observer A. and observer B. just now considered) in nothing more than "reading off" a character from the meaning of the subject, no matter whether this is phenomenally present as imageless knowledge or image² or both. In the case of those observers already instanced as "types" who obtain the meaning of the character at once and then verify it, this "reading off" may be supposed to occur also, although it was not reported as such. We have shown that such observers mostly obtain a character at first without having completely and adequately determined the meaning of the subject. A colour, e.g., comes into consciousness as one character of the subject's meaning and then the meaning adequately develops while this character is being verified. In all these cases we regard the appearance of the character as a tentative predication.

¹ "I tried to *fit* this into its place (fourth) before a green one (fifth). It seemed to *fit* there and I accepted that as my judgment." Prot. 29, quoted in the foregoing.

² In many cases in which the image was reported as present alone, there are reasons to suppose that some knowledge must have been "fused" with it, since the character "read off" does not belong to the image present. A similar observation has been noted in connection with the presence of the meanings, during the learning period. The image was often reported as present; but while drawing the respective pictures the observers gave quite definitely details that were not present in the image itself. In the completion experiments one observer (D.), who is a visualiser, rarely reports coloured images, but he often gives as his predicate a colour which was not present sensorially in the image itself. However, he quite consistently reports the colour as a knowledge "fused" with the image and not sensorially present. Observer B., who frequently reports images as present without reporting knowledge, gives more frequently than any other observer pure "indicative" and "identifying" judgments, which leads us to suppose that he had not anything definite from which to "read off" an adequate character.

We characterise all those judgments in which the character was "read off" from the meaning of the subject as *analytic* judgments in the sense in which they are traditionally conceived. This, however, does not mean that all those Individual Judgments in which the predicate was pronounced at once (either tentatively or ultimately) without any previous full determination of the meaning of the subject were synthetic. The procedure is not analytic but the character does not amplify the meaning of the subject available at the moment in the sense in which synthetic judgments are traditionally conceived to do. The character comes into consciousness by reproduction and we must take it to have been "analysed" previously in the learning period; so that at the end these individual judgments also are to be regarded as analytic. On the other hand, the procedure of observers D. and E. and to some extent C. (i.e. observers with directed activity in reproduction) looks at first glance as if it were a synthetic one since the acceptance of the predicate is often preceded by a long searching through a whole chain of relations. But this searching and all the relations involved concern only the determination of the meaning of the subject. As soon as this has been reached the predicate follows without any further mediation at all. Only observer D. reports sometimes a hesitation before accepting the predicate, but this always had to do with a choice of the character to be "read off" from the knowledge and image present. Thus it may be stated in general that *all Individual Judgments tend to be analytic* (with regard to predication). We should have said that all Individual Judgments *are* analytic, if there were not some exceptional cases in which "synthetic" predication occurred. All these cases are judgments in which the meaning of the subject *could not* be determined adequately. In the predicates of such judgments the character of the subject is replaced either by (1) a relation of the subject to the meaning of some other known picture, or (2) by its relation to a sub-class of the pictures plus their sub-class character, or finally (3) by a general character plus the relation of subsumption of the "individual" under this. In the protocol of observer E. quoted we have a case which may be dubitably regarded as synthetic, the predicate being "one of those three." But we do not consider this predicate sufficiently adequate. We cannot infer from the introspection given whether E. had any knowledge of the character of such a sub-class or whether there was only an "intention" of that class (or only a knowledge of a "sphere" to which the individual belongs).

Similar, but with a more determinate predicate, would be those Individual Judgments in which the meaning of the subject could not be fully determined, but the meaning of some other "individual," to which the subject was related, was quite determinate. The predicate of such judgments is usually expressed in some such way as e.g. "like such and such a picture."

The third class of cases are the Individual Judgments in which the procedure is synthetic in a most prominent manner. They occur only with observer E. who had not an adequate knowledge of the individual pictures. The effect of this was that many of his Individual Judgments were judgments in which the predicate was reached by a process of inference. A general character was at first educed or recalled by memory, then it was universalised, and the "individual" in question was subsumed under the general character. The predicate in these cases is educed by a logical *inference ad subalternatam*. *Frequently in connection with this there is a special voluntary act by which the meaning of the "general" is restricted to the "individual" of which it is predicated.*

We have previously pointed out the difference with regard to the phenomenal presence of the meaning of the subject in two different types of Individual Judgments, viz. those in which the prefix word was a numeral and those in which it was a word indicating a colour. We have also stated that the phenomenal presence of the meaning in all judgments depended on the task and on the way in which this task was solved. With regard to the differences between the two types of Individual Judgments we have seen that the type THE FIRST BOGIL IS — yields 59 per cent. of cases in which the meaning of the subject was present either as imageless knowledge alone or as knowledge preceding images; whereas the cases with the same phenomenal presence of the subject in the type: THE BLUE BOGIL IS — show 27 per cent. On the other hand, images alone were reported as present in 20 per cent. of cases in the first and 52 per cent. of cases in the second type of Individual Judgment. In short, the data indicate that there is a tendency for imageless knowledge to appear in consciousness more frequently in the type THE FIRST BOGIL IS —; and for images to appear more frequently in the type THE BLUE BOGIL IS —.

If we compare these data with predication in the two types of judgment we can see from Table XI that the predicates in the Individual Judgments of the type THE FIRST BOGIL IS — denote mostly some intrinsic character of the pictures. For example, a

colour-character was recorded as predicate for observer A. 80, B. 51, C. 63, D. 70 and E. 30 per cent. times. Shape character was used rarely by most observers in Individual Judgments, giving for observer A. 2, B. 10, C. 2.5, D. 15 and E. 45 per cent. Further, observer A. recorded 9 per cent. of "designating" (or indicative, "that," "this") Individual Judgments, B. 20 per cent. of the same kind, D. 6 and E. 10 per cent. With regard to the type of

Table XI.

The predicate in the Individual Judgments of the type

THE FIRST BOGIL IS —.

(Percentages.)

Colour-character	Shape-character	Position-character	Indicative	(1) Assent to the meaning of subj. or (2) not classified
80	2	0	9	11
51	10	10	20	9
63	2.5	0	2.5	32
70	15	4.5	6	4.5
30	45	0	10	15

Table XII.

The predicate in the Individual Judgments of the type

THE BLUE BOGIL IS —.

(Percentages.)

Observer	"This" or "that"	Place-character	Intrinsic character	Other characters
A.	14	72	0	14
B.	0	100	0	0
C.	50	17	0	33
D.	0	33	50	17
E.	0	40	40	20

judgment THE BLUE BOGIL IS —, most of the responses (cf. Table XII) given as completions are either indications ("this" or "that")—A. 14, C. 50 per cent.—or designate the places of the pictures in the series (first, second, last and so on) e.g. A. 72, B. 100, C. 17, D. 33 and E. 40 per cent. Only observers D. and E. show responses which denote known intrinsic characters of the pictures (50 and 40 per cent. respectively). The other observers (two of whom rarely if ever start with a "directed activity") have not recorded one single case in

these judgments in which an intrinsic character was given as the predicate. If these data are correlated with the frequent occurrence of images which for some observers approaches 100 per cent. and for some is actually 100 per cent., it is to be concluded *that images present in consciousness while judgments are being made serve rather for the identification of the "individuals" than to signify their intrinsic characters.* In other words, *images serve to answer the question "which?" rather than "what?"* When the part judgment THE BLUE BOGIL IS — is presented, it is natural to expect that the answer will be an identification, the intrinsic character (or one of the characters) having been given as a qualification of the subject. On the other hand, when the part judgment THE FIRST BOGIL IS — is presented for completion, it is reasonable to expect that the response will be an intrinsic character of the respective "individual" as an adequate answer to the question "what?" As imageless knowledge was reported more frequently in this type of Individual Judgment than in the other one and as the predicates obtained signify here predominantly an intrinsic character, the corollary is that *knowledge serves better when the question is "what?"* Images serve best to indicate *which individual is meant.*

We have previously stated *that the phenomenal aspect of the meaning of the subject depended on the task.* We can now supplement that statement by another. *The phenomenal aspect is only a function of the determination of the subject and thus is a secondary function of its end or purpose (i.e. final predication).* For, in order to complete the part-judgment THE FIRST BOGIL IS —, one character at least must be educed out of the meaning of the subject. In order to accomplish this eduction the subject must be adequately determined and *only knowledge can adequately determine an "individual."* Thus the appearance of the meaning of the subject in consciousness will depend on this determination as a sub-task. On the other hand, in order to complete THE BLUE BOGIL IS —, it is enough to identify that "individual" and for this purpose an image may suffice. The result of this dependence of the phenomenal aspect of the meaning of the subject has already been discussed. A similar dependence will be demonstrated in all other judgments also.

Universal Affirmative and General Judgments.

Types of judgment which tend to be analytic in the same sense as the Individual Judgments so far considered, are the Universal Affirmative and General Judgments. Here also, once the subject has been determined the predicate tends to come without any further mediation. And here again the relations may be involved before the predicate is educed, but these relations in most cases concern the determination itself, not the predication. This occurs whenever the general character has not already been abstracted and fixed during the learning period. The actual abstraction or eduction of the general character then occurs in the judgment; and very often overlaps the predication itself. Several individuals are for this purpose "reviewed" one after the other, and the general character having been educed is finally accepted as belonging to all. This eduction may not involve the review of the whole series; more frequently it is enough to have only two "individuals" in order to educe a character common to all. When this occurs a "reference" or "intention" to all the remainder, with the thought that they are all alike, "serves" as the "universalising" of the common character.

Individual differences between observers found in completing Individual Judgments have been observed also in the case of Universal Affirmative and General Judgments. Some observers at once obtain the general character, then verify and accept it; whereas others start with a "direction," educe the general character and then accept it. But the procedure varies even with the same observer and depends on whether the general character has been previously fixed or not. Observers D. and E. who usually started with a "direction" in Individual Judgments, now often "refer" to or intend an "individual" as a symbol of the whole set, "universalise" it and then accept it. This is especially frequently the case with E. There is generally a tendency with D. and E. for this process of determination of the subject in these to be shorter than in the Individual Judgments. Even if the general character does not appear quickly as a "ready-made" item, it may be educed from one single "individual," no matter whether this appears as knowledge or an image.

All the observers do not always universalise explicitly a general character in the Universal Affirmative Judgments. This occurs most frequently with observer E., often with D. and sometimes with others. But there is always an implicit thought of "universalising" such a

character. From the context of the reported phenomena the predicate appears to be thought of in some way or other as a universal character. There is a consideration as to whether the character belongs to all "individuals." If this does not prove good, the character may be subjected to a special interpretation (or is "intended") so as to suit all individuals; or the individual itself is re-interpreted so as to be subsumed under the general character. The "individual" which is "apart" from the group is frequently thought of as a negative instance when the general character appears in consciousness. In this case the individual is "forced" under the general character. There are indications in our protocols that in many cases, in which the "universalising" is performed explicitly either because of some individual being difficult to subsume, or the universal predicate being difficult to accept for any reasons, the acceptance is adduced by volition. We have previously mentioned that such acceptance occurred also in the Individual Judgments. We have noted, for example, that observer E. there often reached the predicate by an inference *ad subalternatam*. While there are many cases in the Universal Affirmative Judgments in which an individual was "forced" under the general character, there are only a few cases in which the universal predicate was reached by an inference *ad subalternatam*.

We presented the general part-judgments to our observers without any special instruction, leaving them to decide as to how to regard them. And this decision actually happened with some observers, as we mentioned before in connection with the reappearance of the task in consciousness. The General Judgments were predicated in a similar way as the Universal Affirmative. (The difference was only in that here, while predicating, no picture was "intended.") There was also frequently an absence of the "reviewing" of the "individuals." If such "review" occurred, it functioned more for eduction of the general character if this was not at once available than for generalising or universalising (or better: for applying it to all). The predicate is usually a general or abstract character without any consciousness that it belongs to all. But there are cases in which this "reference" to all did occur. And this was due to consciousness of the task and its interpretation as meaning truly universal judgment. Even the consciousness of the "universal"¹ in the Universal

¹ With regard to the further analysis of the phenomenal aspect of this consciousness of the universal, cf. the very extensive analysis in Aveling, F., *Consciousness of the Universal and the Individual*, § 3, "Conceptual Overknowledge," p. 201.

Affirmative Judgments should be accounted for by the task, since it appears in consciousness frequently together with reappearance of the task. On the other hand, the absence of the consciousness of the "universal" in many cases of the Universal Affirmative Judgments has to be accounted for by mechanisation of the procedure in completing these judgments, so that it appears mostly in the cases in which there is any doubt or difficulty of educing and accepting the predicate. And these are the cases, as we have seen before, in which the task itself reappears in consciousness.

Predication in General Judgments appeared to be for some observers and some sets of pictures much simpler than in any other judgments. This was so especially in the "tied" or "compact" sets in which the general character was already abstracted and fixed during the learning period. The predicate appears here more than in any other judgment immediately after the subject has been determined. No matter in what manner the subject is present phenomenally, the predicate is educed or recalled at once. Even if only a schematic imagery appears in consciousness the general character is immediately "read off" and accepted as a predicate. But here as well as in the Universal Affirmative Judgments a symbol or a best representative picture may be intended while the meaning is being determined, and this intending may occur either preceding or subsequent to the general meaning according to the type of the observer.

We have seen that the predicate tends to represent a colour-character in the Individual Judgments of one type, while in another type it is in most cases indicative or identifying, i.e. being "this" or "that" or representing the number of the individual's place in the series. We saw that only observer E. employed predominantly the shape-characters as predicates in the Individual Judgments. It has been further pointed out in the section on the learning period that the differential characters in all our sets were primarily colours although the different positions and details of the shapes were also such differentiae.

With regard to the Universal Affirmative and General Judgments all the predicates in these for all observers designated a shape-character. Colour-character was used only in one single case when observer E. completed the judgment BOGIL IS — with the predicate "blue" but the meaning of "blue" was then interpreted by him as "coloured." As the most essential characters of the different sets were the shapes, appearance of these as predicates is quite natural.

It is also explicable why observer E. used shape-characters in the Individual Judgments more frequently than any other observer. His meanings for "individuals" were, as it has been repeatedly stated, very poor. His general meanings were much better established. The effect of this was that he applied a general character as a predicate very frequently even in Individual Judgments. In correlation with this is also his frequent use of inference *ad subalternatam* in these judgments.

In the Universal Affirmative and General Judgments some inadequate predicates were also used. This happened sometimes in the judgments in which the subject represented a difficult set (PIMEF and SABOM). The predicates then represented some characteristic which did not pertain so much to the pictures as individuals as to them as members of a series ("scheme"). Such predicates were e.g. "split-up," "pictures," coloured "pictures" and the like.

Particular Affirmative Judgments.

In the Individual Affirmative, Universal Affirmative and General Judgments the meaning of the subject was mostly at the disposal of the observers as an item of knowledge. Only in difficult cases in the last two kinds of judgments an actual abstraction and generalisation occurred during the process of judgment itself. With regard to the Particular Affirmative Judgments, the meaning of the subject was not so readily available for revival as a unitary item. Even if all the pictures of a set were known and the general meaning was formed and stood ready as a fixed item, when a particular judgment about this set was presented for completion, the observer had to discover a character that belonged to some and not to the other pictures. As a set of pictures was a related "whole" of five members, this operation of "particularising" implies a relation of division and that of likeness. A smaller group of pictures has to be selected as consisting of "individuals" with a common character. This group has to be "thought of" ("intended") as a "part" of the set, i.e. to be related to the "whole," and at the same time to be a group related within itself, i.e. its members have to be alike in some respect. When the character of the likeness of such a group has been educed, it is accepted as a predicate.

That these relations operate in Particular Affirmative Judgments although they are not always apprehended by the observers explicitly,

is evident from the description of the processes involved in these judgments. It has been noted before that the task reappears whenever the general character comes into consciousness after reading the stimulus. The observers then express themselves that the general character was "no good" for their purpose, as it belonged to all "individuals." They explicitly want to find some character "*that does not belong to all*"; "*that belongs only to some*." Then they start comparing the individuals. What characterises Particular Affirmative Judgments is a second fact. There is no other kind of judgment in our experiments, except negative ones, in which there occurs more frequently an awareness of some "rule," either theoretical or practical, than in Particular Affirmative Judgments. No matter whether these "rules" concern the method of solution of the task, or are connected with predication itself, they always have to do with the relation of *division*, i.e. they always deal with *relation of "part" and "whole."*

The mental processes involved in the "division" of a group and a comparison of its members do not always occur in all the Particular Affirmative Judgments as separate unit processes. Moreover, the relations between different "individuals" sometimes had already been educed during the learning of the material; so that many of them were available as items of knowledge which had only to be "realised." There are some sets in which several "individuals" form a group for themselves within the set as a larger whole. Two sets, for example, PIMEF and SABOM, each had three pictures which were related in such compact groups as sub-classes, and the collective meanings for these sub-groups of "individuals" were quite definitely formed by some observers. For completion of the Particular Judgments about these sets, it was enough for the prefix word "some" as a relation to direct the observer's activity at once to this part of the set, as soon as the task had been grasped. There is no necessity then for the "individuals" of such a group to be compared in order to educe a common character. The common character in this case is the character of the sub-group already formed.

While the predicates in the Individual Judgments designated mostly colour-characters, and in the Universal Affirmative and General Judgments meant shape-characters, the predicates in the Particular Affirmative Judgments designated besides those two kinds of character also those of size and position. Colours were often explicitly intended to include different shades of the same hue. The brightness

was sometimes meant to include different colours. Shape-character was mostly employed in those sets in which some individuals within a set grouped themselves as a sub-class (MEVOZ and PIMEF). Position-characters were used predominantly in the compact sets (in which all the pictures closely resembled each other in shape). Colours were used in all sets, but most frequently in the "scattered" (or "free"), not "tied" sets.

Table XIII.

The predicate in the Particular Affirmative Judgments.

(Percentages.)

Observer	Colour-character	Shape-character	Position-character	Size-character	Other characters
A.	59	11	0	30	0
B.	76	6	18	0	0
C.	59	35	6	0	0
D.	46	46	8	0	0
E.	21	43	14	8	14

With regard to different observers, the characters employed in predication in the Particular Affirmative Judgments are distributed as follows (Table XIII): A. used the colour-character in 59 per cent. of cases, B. in 76, C. in 59, D. in 46 and E. in 21 per cent. The shape-character was used by A. 11 per cent. times, by B. 6, C. 35, D. 46 and E. 43 per cent. times. A. and B. have been classed as "non-directional" types in reproduction, D. and E. as "directional" types, C. as a transitional type—but frequently falling into the second rather than the first class. From the data shown, it is interesting to note that *the frequency with which the colour-character appears in predicating of the subject marks a fall in passing from the "non-directional" type of observer to the "directional" one. The frequency of using the shape-character, on the contrary, shows a rise in the same respect.*

As for employing the other characters in predication in these judgments, certain kinds of characters are used by different observers regardless of their type. Examples are the position- and size-characters. It seems that there develops a sort of "set" for different observers to compare the "individuals" from a certain point of view. A standard is at first adopted deliberately (e.g. to compare "individuals" according to their size) as a working plan. When later on a similar case is presented for solution, the plan previously adopted

under similar conditions may act in a perseverative manner. There are some cases in which the observers are conscious of having used a certain method or plan previously; and they show in a new but similar situation, a "profit by experience."

The reason why the more frequent use of the *shape-characters* in predication should correlate with more frequent use of "*directed activity*" in reproduction lies in the nature of our material. Our pictures could rightly be regarded as members of the same set only under the aspect of shape. *The relations between the shapes of the individual pictures constituted "wholes," "groups," and "systems" in our material.* Colours did not form any system. (Only by one observer (A.) who was noted for his memory for colours were these used as an inadequate cement in linking up the system in one or two sets; but they were often misleading.) *It was more likely, then, that the shapes (as related links of the system) should be more frequently revived by activity which is directed by relations than the colours—reproduction of which depended more on mere associations.*

Of all other Affirmative Judgments the *Particular* tend more frequently to be *synthetic* than any others. Strictly speaking the prefix words in all other Affirmative Judgments are implied as relations or characters in the meaning of the subject itself. They are thus relations "tied" to the meaning of the subject. "All," for example, means a relation which implicitly pertains to the general meaning of the subject before which it stands. It is an explicit relation only from the point of view of the task. This, we have seen previously, made the only difference between the General and Universal Affirmative Judgments. In the latter, under the influence of the task, there was an explicit reference to all "individuals." In the same sense "all" was "thought of" or "referred to" even in a General Judgment whenever the general meaning was not already abstracted and fixed, but had to be formed in the judgment itself. In that case, "all," although not given in the stimulus, acted again as a task, this time as a subjective one arising under a "situation." But, on the other hand, when the general meaning had been adequately formed during the learning period and was thus a fixed concept, this implied in itself, or meant itself, all individuals from which it had been abstracted, no matter whether they were "thought of" or not at the moment. In the case of a concept then if this is a class concept—as it is in our material—"all" is implied in it as a "constitutive" relation of the "whole" or class. *The concept itself*

is such an abstracted "*constitutive*" relation obtaining with regard to all the members of the class. That such a concept was sometimes "tied" to an "individual," as symbol or best representative, or was attached to a verbal expression, does not change its nature as an *abstracted relation*¹.

Similarly, the prefix word, as a relation or character in Individual Judgments, implied a character given in the meaning of the subject. The numerals "the first," "the second," and so on, were place-relations or place-characters, which pertained as characters to the meaning of the "individual" designated by the subject. They were "constitutive parts" of the respective individual meanings. The prefix word which designated a colour implied also such a character. Thus, in Individual Judgments, as well as in General and Universal Affirmative ones, the relations and characters given by the prefix words in the stimulus were "tied," and implicit in the subject. Here again they acted as "explicit" only from the point of view of the task and when the respective individual meaning was not at once available. In these cases they functioned as part-tasks in the "direction" of activity.

Quite differently from the relations and characters implied in those prefix words in the judgments so far considered, the relation denoted by the prefix "some" is not "tied" to (nor implicit in) the meaning of the subject which it quantifies. It is here a "free" relation. Whatever the meaning of the subject may be, and however adequately it may be determined, the predicate cannot be "read off" as it can be in other Affirmative Judgments. The character has to be educed (and then accepted) as predicate; and in order to be adequately educed it has to satisfy the relation implied in the prefix word.

We have seen that predication in these judgments represents a complicated operation. This implies at least determining a "part" of the "whole," viz. selecting at least two individuals and their comparison. But there are cases in which the eduction of the pre-

¹ In our experiments, both at the end of the learning period and while the judgments were completed, there was a tendency for this *abstracted "constitutive" relation* to be attached in "tied" sets ("compact" sets in which the members closely resembled each other) to an individual as "symbol" which was usually either the first member or the best representative of the set. Non-visualisers used to "intend" it only, visualisers to have also a schematic image (which by the way without "intention" could not represent any individual). In "free" sets the "concept" was "attached" to a verbal expression or name, for example "sinus," "mouth of a flower," "root" and the like.

dicate occurs without any mediation of such comparison, even without any knowledge of the "individuals" which constitute that part of the group with regard to which a predicate is to be asserted. Instead of having at first a fixed general meaning, then selection of at least two individuals, then their comparison and the eduction of the character common to both, the process may run exactly as that observed in carrying out tests of "opposites." An item becomes present in consciousness and a character is educed as differing from it and yet as belonging to "some" individuals none of which is consciously present. What mediates the eduction is the knowledge of the general "scheme" or system. The observer knows the "plan" or "schematic" order of the set. He knows, for example, that the "individuals" of the set differ in position but are similar in shape. When he thus obtains the knowledge of one individual he knows "schematically" what the remaining ones will be *under the aspect of the system or plan*, and of the *difference* from the known character. An illustrative example is as follows:

SOME DIPUV ARE (inverted). Introspection: "I read the stimulus auditory-kinaesthetically. Meaning of DIPUV was not present at first. It arose with an intentional direction towards the first DIPUV, but with a knowledge that the *others were similar* to it, though *varying from it in position*. The word 'inverted' was present auditory-kinaesthetically, and was accepted as applying to some of the figures in the series. The series was not present as universal but collective. There was some conation in this reaction when I was searching for the meaning of DIPUV; but none was introspected in connection with the predicate. (The idea 'inverted' seemed to arise like an 'opposite' in the 'opposite' tests to the *upright* first DIPUV.)" Observer E., R.T. 1416, prot. 98.

Negative Judgments.

We have seen that in most Affirmative Judgments previously discussed, except in particular affirmative ones, one character of the meaning of the subject is generally apprehended or "read off" as soon as this meaning has been determined; then it is accepted as predicate. Only in the judgments in which the meaning of the subject could not be adequately determined, this predicate had to be reached by a more complicated procedure. In the types of Negative Judgment which we have employed in our experiments the determination of the subject previous to predication appeared to be often unnecessary. At least as soon as the observers acquired some practice in the procedure of completion they tend to pass at once to the predication itself.

In the Particular Affirmative Judgments the prefix word "some" signified a "free" relation, i.e. a relation which was not implied in the meaning of the subject itself; at any rate it was not implied in it from a psychological point of view. In the Negative Judgments the meaning of the prefix word was in the same way or even more decidedly "free" in this respect. "No" and "not" in all our Negative Judgments meant such a relation. Whether this agrees with any logical theory of negative judgments or not all our protocols indicate it as a fact. In whatever way the types of the judgments, which we have employed, may be conceived logically, there was no doubt about their psychological nature as indicated by our introspections.

At the beginning all our observers try first to determine the meaning of the subject. When they accomplish this the predicate is educed as a correlate in virtue of Spearman's third noegenetic principle in the same manner as an opposite is educed in the "opposite tests." The eduction may, however, not be so simple in the cases in which the observers have to complete a negative judgment for the first time. They may, after determining the subject, "refer" or "intend" at first another series or another picture in the series (according to the task); obtain *its* meaning; "read off" a character of that meaning; and finally predicate it as negative to the subject. But here again, the third noegenetic principle is chiefly applied—though in this special case conjointly with the first principle of apprehension, i.e. "reading off" of the character. The obtained meaning of the subject is one fundament; "no" as the part-task (which may be "thought of" or may sink out of consciousness) serves as the relation leading to the obtaining of the meaning of some other series or some other picture, from which finally the character is "read off." Or the chain of processes may be still shorter. A character of the meaning of the subject is apprehended, or is simply reproduced immediately (especially in the case of the non-directional type of observer), and another character "opposite" to it, or differing from it, is educed by the relation implied in "no" or "not." The example of a complete chain of eductive and reproductive processes will be (as an ideal case) in the judgment NO BOGIL IS — as follows: (1) determination of meaning of BOGIL, (2) apprehending of one of its characters, e.g. "trifoliolate," (3) thought of some other series, e.g. PETUL, (4) determination of its meaning, (5) comparison of BOGIL and PETUL, (6) eduction of a character of PETUL as differing from or "opposite" to the character "trifoliolate" of BOGIL, e.g. "humped,"

(7) final predication with acceptance of its being true—NO BOGIL IS HUMPED.

Some steps in this long procedure may fall out. For example the steps under (2) may not appear as a separate unit process since the character "trifoliate" "constitutes" the meaning of BOGIL. (3), (4) and (5) may also fall out since the character "humped" may be educed and reproduced without mediation of these. Even the step under (1) may not occur at all. In that case a character is obtained and another character differing from it is educed and reproduced immediately (i.e. without mediation of any other processes). On the other hand, a step may be interpolated between (1) and (2) as a thought of a principle or method with regard to the standard or point of view of comparison to be taken in educating.

But the predicate as the completion of the judgment in the example above given may be "triangle," "square," "round," "black," "white," "yellow" (the colour not used in our material), "sharply pointed" and indeed *anything*, as the observers often explicitly express. What character is finally adopted for predication depends on which character of the meaning of BOGIL will be "opposed," whether that meaning was quite adequately determined or only abstractly conceived, and how widely the relation "no" itself was conceived. On the "conception" of this relation depends whether another set of the pictures will be "intended" or an individual picture of a series will be "referred to." This will also depend on the task, viz.: to complete a Singular, Particular or Universal Negative Judgment. Finally it will depend upon whether some "other" thing outside of our material will be "thought of." The range of the "no" and "not" may thus include the *relations of slight dissimilarity, difference, oppositeness and disparateness*.

How adequately the predicate will apply negatively to the subject within the relation implied in the system of knowledge for our material, will depend also on the knowledge available at the moment, on the subjective task to give a good response—or to react only according to the instruction "as quickly as possible"—and on the method of solving the task. The last always implies some practical "rule," principle or standard which is consciously adopted whenever a new type of judgment is presented for completion. Even later on, when, after some practice, the kind of response tends to be habitual, the observers may adopt some new principle or standard of comparing, and this always under the influence of the subjective task. And all

along in spite of the mechanisation which appears as the effect of practice, and of frequent repetition of the responses as the effect of perseveration, the reactions nevertheless become more and more adequate. This growing of adequateness manifests itself in a continuous narrowing of the relation implied in the prefix "no," and, at the same time, the relations implied in the "system" of our material begin to co-operate in the processes of eduction also. Thus, in Universal Negative Judgments some "other" series of the pictures becomes intended after practice instead of "any other thing."¹ In the same fashion, in the Particular and Individual Negative Judgments, some other "individuals" or "individual" respectively tend to be more frequently "intended" after short practice.

We now present some examples from our protocols; and in preference we give at first introspections of a few completions made during that part of the experiments in which there were not yet present any effects of practice in completing this kind of judgment.

NO SABOM IS (round). Introspection: "There was a little tension in the fore period. I read the stimulus. Then there was a little start of surprise. Then a blank. Then I seemed to have been trying to find an adequate adjective, and none came. Then I had a knowledge of *two arms* which entered into my general scheme for SABOM. Then I said: 'No SABOM is *round*.' I felt satisfied." Observer A., R.T. 2135, prot. 10.

NO LUMIG IS (roundish). Introspection: "There was some surprise in seeing the stimulus and the feeling that I could not revive any quality that is not present in LUMIG. There was a feeling of impotence and of my energy being closed round as if there was a barrier. I was conscious of a feeling of striving which seemed to be directed from myself as centre to several different directions. That was all that was present for a moment. I then tried definitely by repeating these words again to get my energy into an objective cognitive channel. There was a tendency to make an effort—to *try for an exclusion on the grounds of colour*. 'No LUMIG is brown' was *half formulated and rejected*. When this had been rejected, I became conscious visually of the long *pointed shape* of several LUMIGS in turn with a feeling of confidence. I seized on that as my *general character for LUMIG*, and immediately made the judgment: 'no

¹ In this way the genus proximum, under which as an aspect or "scheme" the eduction occurs, is an abstract notion of the "picture" in general used in our experiments (in all seven sets); whereas at the beginning of the "completion experiments" the genus may be as wide as to mean merely a "thing." There are transitional cases in which the scope becomes more narrowed but not yet to such an extent as to give an adequate character as response. Such cases are those in which the eduction of the predicate occurs under the aspect of a quality taken from the visual field, and response is, for example, "black." Further improvement is when colour in general is taken as the standard of comparison until it is narrowed down to the colours used in our material. The same applies to the shape-characters given as response.

With this in view the range of relations (from slight dissimilarity to total disparity intended in "no" and "not," and the adequateness of the responses is accounted for.

LUMIG is *roundish*.' As that judgment was formulated there was a distinct feeling of relaxation." Observer B., R.T. 6910, prot. 7.

NO SABOM IS (black). Introspection: "I read 'NO SABOM IS' and had a pause. There was then a vague knowledge of some of the SABOM pictures—their colour. I knew that I could recall the series if I wished to; but there was a feeling that it was unnecessary. There was then another reference to the card, and desire to complete the phrase with something *ridiculous*. I thought this would not be fulfilling the instructions. Then the *colour* mentioned before was present again in a vague way. This gave rise to the thought that none of the series was *black*. There was another reference to the *task* and I reacted 'no SABOM is black.'" Observer C., R.T. 1431, Prot. 10.

NO LUMIG IS (square). Introspection: "Heard the clock;—start. Start on hearing the buzzer. At the stimulus LUMIG the word was prominent. 'No' was more marginal. A serious effort with consciousness of action to know what LUMIG meant. There was a vague intentional direction towards the first LUMIG with knowledge that it was an indifferently coloured figure with *the end something like a fleur-de-lis*. This knowledge of the *shape* was accepted as typical of all LUMIGS—or better of 'the' LUMIG. I reacted '*square*' with *absolute conviction* that no LUMIG could be square. No images." Observer E., R.T. 2243, prot. 7.

The introspections so far quoted already indicate the nature of the processes involved in Negative Judgments of the type NO BOGIL IS —. The eduction of the predicate as a character *different* from the character implied in the meaning of the subject is quite clearly indicated. Observer A. educes and reproduces the character "round" in opposition to the knowledge of "two arms" which is for him the "general scheme" of SABOM. In the same manner character "roundish" is educes by B. as an opposite to "pointed shape." Similarly "black" appears as predicate in the judgment made by C., while there was "colour present in a vague way." And in the last example "square" is reacted with after the fleur-de-lis shape was accepted as typical of all LUMIGS. In most introspections quoted the "principle" or method is reported as consciously present, and by observer C. (who was not a student of Psychology and did not know anything about Logic) it was peculiarly expressed as "to complete the phrase with something ridiculous" (where "something ridiculous" really meant "something opposite").

Further examples in the case of Negative Judgments are as follows:

NO PETUL IS (blue). Introspection: "I read the stimulus. Realised that it is negative and that it is difficult. My general scheme was present very faintly, but I thought I must get away from that. I tried to form a judgment on the *shape* of some PETUL. There was thought of roundness. Rejected that, then turned my attention to the *colour*. Succeeded in knowing that *no PETUL was blue, without however recalling the actual colours of the PETULS*. Gave the reaction in inner speech—'no PETUL is blue.'" Observer A., R.T. 1198, prot. 103.

NO PETUL IS (toothed). Introspection: "When I saw the stimulus I knew the general meaning of PETUL. I had a schematic image without reference to any individual picture. At this time 'no,' which was prominent at the beginning, was in the background of consciousness. There was then an intentional direction towards *some other* series. Knowledge of BOGIL came with the word auditory-kinaesthetically 'flower-like.' I rejected that. Then a *schematic image* representing the MEVOZ series, with only *three or four projections pointing downwards*, became present. I accepted that, saying in loud voice 'toothed' meaning that familiar shape which was for me the symbol of MEVOZ. (When I had BOGIL and then MEVOZ, PETUL was no longer in my consciousness.)" Note of the observer: "Rejection of 'flower-like' was probably due to the fact that the first PETUL was also 'flower-like' so that this character could not be applied negatively to all PETULS." Observer D., R.T. 4931, prot. 103.

SOME BOGIL ARE NOT (upright). Introspection: "There was some difficulty in grasping the task. I was quite conscious of the general character of BOGIL and there was definite *search for a quality which some had and others had not*. (This was the mental set.) Most of the BOGILS developed in turn, although not in order, as visual images. Then the fact broke in upon me (very suddenly as to strike me) that some BOGIL were not upright. As soon as I had insight of that knowledge, I reacted." Observer B., R.T. 6136, prot. 109.

SOME BOGIL ARE NOT (blue). Introspection: "I read the first part of the stimulus 'some BOGIL' and thought 'this is difficult,' and then in some way I perceived 'are' and then 'not,' and I knew that this was a new stimulus. Then I had a feeling that it had enough (difficulty) to be 'some,' but 'some not' is not worth trying. I made a conscious effort to get *any* BOGIL, in order to start my chain of thought; and I knew that *there was a blue* BOGIL without knowing its shape. Then there was a feeling of helplessness equivalent to: 'I can't fit that idea into this form of judgment.' I tried to recall other BOGILS, but did not succeed. Then I returned to the idea of 'blue' and I thought: '*even if there is only one BOGIL, the judgment would be correct.*' So I gave 'some BOGIL are not blue' (and immediately I was conscious that there were two pink BOGILS)." Observer A., R.T. 3957, prot. 116.

SOME MEVOZ ARE NOT (brilliant red). Introspection: I saw the stimulus. After a short pause I had knowledge of the general character of the set. A schematic image with a few projections, which could represent any one of the middle figures, appeared in consciousness. The knowledge of blue colour came then with the word 'blue' auditory-kinaesthetically. I was going to pronounce that word, but I thought that would not be a good judgment. In striving to find something else a red image of the fifth MEVOZ came with consciousness that it was '*apart*' from all other MEVOZES by its peculiarity of shape and its *brilliant red* colour. With an intentional direction backwards *towards the rest of the series*, as if making a mental indication which might be approximately described to mean 'they are different in shape and colour from this one' I said: 'brilliant red.' (There might have been some conation in rejecting the first suggested colour.)" Observer D., R.T. 5127, prot. 125.

THE FIFTH LUMIG IS NOT (like the first). Introspection: "Read stimulus auditory-kinaesthetically. Fairly clear knowledge of the first LUMIG; very vague knowledge of the fifth, so vague as to be almost meaningless. General knowledge that the figures were *unlike* as to position, colour, etc. Reacted auditory-kinaesthetically: '*Like the first*' without any real comparison of the

first and fifth, but from the basis of general knowledge that the figures *were unlike*." Observer E., R.T. 4389, prot. 117.

THE FIFTH BOGIL IS NOT (blue). Introspection: "When I read stimulus I had the thought immediately that the fifth BOGIL is lavender, but I was not sure of that. Then I became doubtful whether it was lavender or not. Then I felt I had been wasting time in that process and I thought: '*whatever the fifth BOGIL is, whether lavender or not, it is not blue because only one BOGIL is blue and that is first.*'" So I gave judgment mentally 'the fifth BOGIL is not blue.'" Observer A., R.T. 2703, prot. 137.

THE FIFTH BOGIL IS NOT (blue). Introspection: "Intentional knowledge of *fifth BOGIL*. Not very clear knowledge that *first BOGIL* was *blue*. The fifth was *unlike the first as to colour*. Reacted 'blue' auditory-kinaesthetically." Observer E., R.T. 1638, prot. 129.

The introspections presented in the foregoing paragraphs show the completion of Negative Judgments after the observers have become familiar to some extent with the procedure involved in the solution of the task. The meaning of the subject with regard to its determinateness tends to fall more and more into the background of consciousness, and the *relation of difference* with the consciousness of "scheme" tends to be more prominent after some practice. This relation of difference is indicated in the introspections by the search at once for a *different* character. In this the "schematic" knowledge of the order and system is a guiding principle. At the end (especially for the type of observer with directional reproduction) "no" and "not" begin to work as "directive" relations without any preliminary step in determining the meaning of the subject. The observer looks now more for "*what not*" than for "what"; and many observers explicitly mention this fact. Thus if, for example, "The first BOGIL is not" is given for completion, there is no necessity for the meaning of the subject to develop. The predicate is reached by a process of education in which "the first," as signifying a place in the "order" serves as a half determinate fundament, "not" as a relation (viz.: as merely an opposite direction to "the first place") and the whole scheme as a wider relation embracing the whole "order." That the "scheme" as an unrealised knowledge works more frequently and efficiently in negative than in positive judgments is evident from our protocols. The observers know, for example, that there is only one blue BOGIL; they may not know exactly its place order, but *they do know that it is not the fifth*. A still more general "scheme" is the vague knowledge of the whole system embracing all the sets. And some characters of that "scheme" are not vague at all but are known with full determinateness. The observers are quite certain that there

is only one "first picture" of all the sets which is blue and that that picture is the first BOGIL. The character "blue" can thus be selected as predicate for any Individual Negative Judgment in which the subject denotes the first picture of any other set than BOGIL. In the same way the observers use "yellow" as predicate more frequently than any other colour in predicating in Universal Negative Judgments, *knowing* that the *yellow colour was not employed in our material at all*. For verification of such a predicate it is quite unnecessary to review all the pictures of a certain set. This is the reason why observers of the "verification" type do not employ any actual revival of "individuals" and their relations for verification in a Negative Judgment. Instead, they employ here general "rules" and "schemes" of their system of knowledge. A., who was in Affirmative Judgments noted for his use of "verification," uses now (in negative ones) such "rules" (cf. e.g. protocol 137 quoted in the foregoing, p. 111).

That our *Negative Judgments consist in relation and correlate educing* (chiefly the relation of difference in general) is evident also from the fact that there is *practically no difference between the Particular Affirmative and Particular Negative Judgments with regard to the processes involved*. Both involve the procedure of "division." There were indeed a few Particular Affirmative Judgments in our experiments in which the predicate was expressed in a negative form, so that, but for the task given, they could not be distinguished from Negative Judgments. We have also seen that the procedure of eduction by "opposition" was sometimes used in Particular Affirmative Judgments in the same way as in negative ones. Finally, we now see that "division" is used in Particular Negative Judgments in exactly the same manner as in Particular Affirmative ones.

Messer, in his experimental work on the Psychology of Thought¹ maintains that negative judgment consists in the denial of another judgment which latter is to be regarded as a tentative judgment. In maintaining this he agrees with the theory of Sigwart. From the introspective protocols cited in his work one would infer that he used in his experiments only that type of negative judgment which supported the theory mentioned above. He presented two items with a relation between them to be accepted or rejected by his observers, e.g. "Nietzsche-systematisch" and the response was "gar nicht," or "Italien-mächtig," the answer being "nein." It is quite

¹ Messer, A., "Experimentell-psychologische Untersuchungen über das Denken," *Archiv für die gesamte Psychologie*, 8 Bd. 1906.

obvious that in negative judgments of this type we have a denial. But it is not therefore obvious that all negative judgments are denials; and it is certain that the type of negative judgment which we have observed in our experiments does not consist in a denial at all.

A little later¹, in the same work, Messer distinguishes between a simple negative (*einfach verneinende*) and denying (*bestätigte verneinende*) judgment. The latter he designates also as rejection (*verwerfende*). From this latter designation ("rejection") we presume that he means by "simple negative" a judgment corresponding to the types employed in our experiments; though the passage in connection with his distinction between the two types of negative judgments is not quite clear to us. Moreover there is no mention of difference with regard to the processes involved in the respective types.

In his *Psychologie*² Messer is more definite with regard to the nature of negative judgments. Here, he does not allow a denial to be reduced to an experience of relation, viz. that of difference. We do not think ourselves that denial is to be reduced to a relation, although one might argue that some kind of the relation of "evidence" could serve this purpose. Our argument is that *there are negative judgments in which there is no denial*, and that *these judgments are to be regarded as an acceptance of a relation of difference* ("difference" in the widest possible sense). In refuting the theory which reduces negative judgments to the experience of relation, Messer points out that this reduction is "artificial" and "without sufficient verification by introspection."³ In answer to this we think we have brought forward quite sufficient introspective evidence. All our protocols quoted in the foregoing in connection with negative judgments clearly indicate that *the operations involved in these judgments are the same as those involved in "opposites" tests*. The principle by which these operations were governed is the third noegenetic principle of Spearman, i.e. eduction of correlates; and in this particular case is the eduction of an opposite—the fundament and this relation being given. Although the processes involved were the same as those in "opposites" tests, we have already pointed out that the relation involved need not be that of oppositeness; it may be any relation of difference in general.

¹ *Ibid.* p. 120.

² Messer, A., *Psychologie*, Stuttgart und Berlin, 1922.

³ "Ebenso erscheint mir die Zurückführung des Verneinungsaktes auf ein Beziehungserlebnis, nämlich auf das der Verschiedenheit, *künstlich und ohne ausreichende Bestätigung in der Selbstbeobachtung.*" *Ibid.* p. 213. (Italics ours.)

In our introspections we could not find any denials connected with the predication in negative judgments. If there were any, these had always to do with some tentative judgment (Messer's "Versuchsurteil") which was rejected; and to this extent these cases could fit in with Messer's theory. But denials of this kind were only intermediate processes before the final acceptance of the predicate. As such they occurred in affirmative judgments as frequently as in negative ones. Indeed, we can say from our introspective data that they occurred as intermediate processes more frequently in affirmative than in negative judgments (cf. the cases of the "verification" type of our observers in affirmative judgments). The reason for this lies in the fact that the eduction and acceptance of the predicate in an affirmative judgment requires the meaning of the subject to be more determinate than is necessary in negative judgments.

A further proof that our negative judgments could not be essentially distinguished from affirmative ones is that they had, under the same conditions, to be accepted as true in the same way as these. Moreover, they were accepted with every different degree of insight, ranging from uncertainty through belief to absolute certainty. We should point out, however, that the predicate was accepted *with certainty* more frequently in negative than in affirmative judgments. The reason for this is again the fact that predication in negative judgments does not require full determination of the meaning of the subject. As long as the relation of difference is present in consciousness, the predicate may be educed as one fundament although the other one (meaning of the subject) is not clearly present or sometimes indeed not at all consciously present.

Similar results with regard to negative judgments have been obtained by Wolters in his experimental work on the process of negation¹. This author divides negation into two forms: Negatives of Construction and Negatives of Denial. The first form is found to be psychologically the same as the affirmative kind of judgment. Wolters makes the nature of negative constructive judgments consist in oppositeness, in contrast. He reduces predication in these judgments to an association of contrast.

¹ Wolters, A. W., "The Process of Negation," *Brit. J. of Psychol.* VIII, 1916,

DYNAMIC ASPECT OF THE PROCESSES INVOLVED IN JUDGMENTS AS
INTROSPECTED AND ESTIMATED BY OBJECTIVE DATA.

We have considered so far mainly the cognitional aspect of the processes involved in judgments. Activities involved have also been considered already to a great extent, but only from the point of view of the "task," and with the preoccupation as to how they work and bring about the results required by the task. We wish now to bring out some points with regard to the quantitative aspect of the activities displayed while the judgments were being made. Previously, we have treated all the activities from a cognitional point of view; now we shall treat them rather from that of their *intrinsic dynamic* aspect. For this purpose we have employed the introspective records, reaction times measured by Hipp's chronoscope, and records of the changes in the apparent resistance of the observers to an electric current during the respective mental processes. Two researches from the Psychological Department of the University of London King's College, have already shown that there is some correlation between the changes in the resistance of the observer's organism and the conative phenomena involved in the solution of the task, viz. that intense conative phenomena correlate with the amount of decrease in resistance¹.

Without entering into any discussion as to the physiological nature of the psychogalvanic reflex—for we think that the final elucidation of this question requires special investigations on the part of physiologists themselves rather than on that of psychologists—we have used the reflex only as a technical means for distinguishing mental phenomena. And, as we are not yet quite clear about its nature, all we have tried to do was to find any connection which may obtain between the psychogalvanic reflex and the introspected phenomena. So long as a correlation obtains between the two, and whatever the nature of the concomitant phenomena on the physiological and physical side may be, this will objectively indicate and to some extent elucidate the phenomena observable in consciousness. Further objective indications we believe we have found in the different degrees of difficulty in the solutions of the task (different judgments) and in the length of time required for these solutions. Knowing how difficult it is to introspect conative processes, when these were not reported, we have taken into consideration "situations" with which the ob-

¹ Wells, H. M., and McCarthy, R. C., *op. cit.*

servers found themselves confronted, especially if these were entirely similar to those in which they were able to observe the phenomena in question. Lastly, we consider that our subjective or qualitative data here (i.e. those obtained from the recorded introspections) indirectly gain in objective value from their agreement with the qualitative data previously obtained quite independently in respect of other phenomena involved in our judgments¹.

As indicated by our recorded introspections, the activities manifested in consciousness during the solution of the tasks show different characters. These characters depend on the nature of the stimulus-task; on the means at disposal for its solution (knowledge acquired during the learning period); and on individual "primordial potencies"² (application of "rules," method, working plan, control of conation, and the like). The protocols previously presented show different procedures with regard to the solution of different tasks by the same observer and with regard to the solution of the same task by different observers. For example, in Particular Affirmative Judgments, the observers often *adopted an attitude* in respect of the method to be used in the completion of the given part-judgment. In the completion of General Judgments also, cases have been shown in which they had to *decide* how to regard this kind of judgment. In this particular case adoption of an attitude had to do not with the solution but with the interpretation of the task. *We distinguish cases of activity in which such an act occurred from those in which activity was reported but no special attitude was adopted by the observer at the moment.* Even among these latter cases we can distinguish those in which the activity was guided by some relation, from those in which it was a "blind" and rude "force." Nevertheless, all three forms of activity were conditioned (although not to the same extent) by the primary acceptance of the instruction. The difference is that in one case the observer had to "adapt" *himself* to the situation that had arisen, whereas in the other two cases no such conscious adaptation occurred. In one of these, however, the activity was "directed"; but this direction was guided by the relations themselves without any conscious *interference on the part of the observer*.

Whatever names may be given to the activities mentioned, we find in our protocols fairly definite characteristics of their different forms. On the one hand, we find "decision," "resolution," "accept-

¹ Cf. Phenomenal aspect of the meaning of subject, also predication.

² Spearman, C., *The Nature of "Intelligence,"* p. 136.

ance," "determination"; on the other hand: "striving," "searching," "looking for," "endeavouring," "trying," "mental effort," "mental tension," "consciousness of action," "alertness," "concentration of attention," "direction of attention," "swing of attention," "feeling of impotence," "feeling of difficulty," and the like. Without binding ourselves to any theory on will processes or any final classification of different forms of activity, we think that our protocols and our objective data indicate quite clearly a difference between the two forms as designated by the expressions used by our observers and divided into the two groups as shown above. The first group of expressions clearly connotes for us *volition*; the second we take to indicate *conation*. It is needless to say that the two forms may both be characters of the same dynamic state of consciousness; or that they may follow one another. For example, "concentration of attention" or "direction of attention" may be started *purposely* and *consciously* by the observer *himself*. In most cases they are conditioned—at least indirectly—by volition, viz. by the primary act of acceptance of the instruction and are only discharged by the perception of the stimulus. In other cases conation may be connected directly with a volitional act during the solution of the task itself. We find, e.g. reports like: "decided to try," "decided to make an effort," but here, as well as in all those cases in which there was a special adoption of a method of solution, we have volition clearly distinguished from conation. The difference between the two cases is that in the latter the effort as the effect of a decision is more "rational," i.e. is guided by relations implied in the "rule"; whereas in the other case, although it is conditioned directly by a volition, there is no knowledge as to *how* to "try," there is nothing to direct the mental energy.

With regard to the sequence of the cognitional processes which were permeated by conation while they were involved in completing the judgments, there is some regularity with which different observers report this conation. They rarely report it as involved in the acceptance of a judgment. *Such conation as was reported had always to do with the determination of the meaning of the subject.* There was only one observer (B.) who frequently reported conation involved in predication itself. But it has already been noted that B. makes his judgments with an assent or adhesion¹ to the obtained meaning of

¹ Judging from his introspective records it seems that his "assents" and "adhesions" are very *conative* in character.

the subject. More than any other observer he recorded mere identifying, indicative or demonstrative judgments. In connection with our discussions on the phenomenal aspect of the meaning of the subject¹ and on the characters used as predicates² it was pointed out that most of his judgments (especially Individual, General and Universal Affirmative) were judgments on a perceptual level. On the other hand, *the other observers also reported conation involved in predicating whenever this latter consisted in a mere designation, and the like.*

On the contrary, observer B. hardly ever reports any volition at all³; and if he does report it, this always occurs at the beginning of the solution of the task and has always to do with the adoption of some method. This, again, rarely occurs in Individual, General and Universal Affirmative Judgments (although volition occurs in these judgments also in the cases in which it is connected with interpretation of the task), but it invariably does occur in Particular Affirmative and Negative Judgments, especially when these were presented for the first time.

Observer B. was noted also for his *tentative judgments; and his rejections before the final acceptance of the predicate were very often coloured with a conative character.* He frequently reported "acceptance of the predicate"; but this acceptance, judging from the "situations" in which it appears, can hardly be called volitional. It seems to consist merely of an *insight*.

Observer C., who together with B. was noted previously for his "non-directional" reproduction and "verification," frequently reports also phenomena which are of a conative character. The difference between him and B. is that he does not report any conation in predication itself. But, on the whole, *these two observers of the "non-directional" type report more intensive forms of conation in determining the meaning of the subject, than A., who otherwise belongs to the same group, and the other two observers (D. and E.) who invariably start their determination of the subject with a "direction."* There is another difference among the three observers themselves of the associative reproductive type. Whereas B., who reports very high degrees of intensity of conation, almost of an impulsive nature, does not report volitional phenomena, the other two (A. and C.)

¹ *Ante*, pp. 63, 64.

² *Ante*, p. 92.

³ "Assents" and "adhesions" frequently reported by him are conational rather than volitional in character.

report them frequently both with regard to adopting a method and in the final acceptance of the predicate.

The other group of observers (D. and E.) noted for their "direction" in reproduction and observer A. of the "non-directional" group, do not show such "impulsive" activity. One observer (E.) of this group, who more frequently than any other distinguishes between conative and volitional dynamic states, reports explicitly and invariably "no conation observable in predication." On the other hand, he frequently reports volition while adopting a method, applying a "rule" and in predication itself. Even when determining the meaning of the subject he does not report conative phenomena equally often in all cases. Mostly they are reported by him in the cases in which an individual has to be determined, and in all those cases in which he has to rely on mere reproduction. Observers A. and D., who had the meanings of the individual pictures far better established, also frequently report conative phenomena whenever there is some lack of relation in reproducing different items.

When we compare the cases in which observers A., D. and E. report strong conation with the cases of B. and C. (and particularly B.) who are of an associative reproductive type, the conclusion must be drawn that conation has more to do with a "non-directional" than with a "directed" reproduction.

On the one hand, *the educing of relations and correlates, abstracting and universalising, so long as the fundamentals are given, tend to be permeated with less intensive or very little conation if any. All conation, with regard to cognitional processes, appears to be connected with the reproduction of items and their clarification¹ rather than with educing relations and correlates in other words with operations on the lower, rather than the higher level of consciousness. On the other hand, the applying of a "rule," adopting of a method, accepting of a predicate on the grounds of an inference (synthetic judgments) tend to be connected, on the dynamic side, with volition. In the same way as the "rules," methods, plans of work and logical inferences mark a "rationalisation" of the processes on the cognitional side, they mark a saving from the point of view of economy of "mental energy" and thus bear a dynamic aspect of distinctly volitional character.*

We have previously seen, from the data obtained with regard to the phenomenal aspect of the meaning of the subject, that images functioned in our judgments in helping to solve the task "which?"

¹ There are many examples of this when the observers try to visualise a vague item.

rather than the task "what?" This function of the image was seen to correlate with the fact that one type of Individual Judgment (in which images were invariably present) tended always to be of a "designative" character. At that time we stressed the fact that these judgments were made on the perceptual level. We have just seen that observer B., who showed the tendency to make judgments of a "designative" character, reports conation involved in predication more frequently than any other observer. We have seen further that the other observers also, whenever they report conation involved in predication, report it mostly in connection with "designation" or "indication." Our conclusion therefore is that *whenever conation is involved in cognitive processes it tends to be connected with such processes only in so far as they occur on the sensorial level*. Before giving reaction times and percentage falls in apparent resistance of our observers recorded during the completion of the different judgments, we shall present some protocols of all our five observers individually in order to show introspected conational and volitional phenomena. At the same time the photographic records of the falls in resistance taken synchronously are shown. The photographic records of B. and C. unfortunately are not of great value owing to the high resistance of these two observers. Observer B. had high resistance almost throughout all the experiments. Observer C. registered very high resistance in about two-thirds of all his sittings; so that although we have some valuable records of his deflections we thought it better not to use them together with the records of our other three observers who show a stable resistance throughout all the experiments. We shall show, however, a few photographs of observer C.

In order that our photographic records may better serve for illustration we should say that the sensitised paper was 0.433 m. distant from the galvanometric mirror. In photograph 1 the distance *ab* represents a fall of 16 mm. (at 1 m. distance this is 36.94 mm.) which is 3.25 per cent. We have measured in all our photographic records the speed of the fall. The speed, e.g. in photograph 1 is represented by $ab/ac = \frac{16}{5} = 3$. There are three falls of resistance in photograph 1: at (1) when the observer heard the sound of the clock in the dark room; at (2) when he heard the signal; and at (3) when he began to solve the task after perceiving the stimulus.

The protocols are as follows:

(1) THE SECOND BOGIL IS (pink). Introspection: "I heard the clock. Started at signal. Read stimulus. BOGIL meant abstractly. There was a knowledge

that one of BOGILS was blue. There was then *direction of attention* towards the second BOGIL with the belief that it was pink. No image. No knowledge of its localisation. Reacted 'pink.'" Observer E., R.T. 1671, fall 3.25 per cent., prot. 25. See phot. 1 in Fig. XVIII.

(2) THE THIRD DIPUV IS (—). Introspection: "Read stimulus auditory-kinaesthetically. Abstract meaning of DIPUV arose. Belief that I could not get the third. No individual DIPUV came to mind. *Waited passively. Stimulus was repeated once or twice* auditory-kinaesthetically. Knowledge that I had taken long time, and with *slight feeling of activity* I stopped the reaction. No judgment was made." Observer E., R.T. 8257, fall 2.05 per cent., prot. 39. See phot. 2 in Fig. XVIII.

(3) THE FOURTH SABOM IS (small). Introspection: "Read stimulus auditory-kinaesthetically. Meaning 'fourth' was accepted. *Abstract meaning* of SABOM arose with a knowledge of the first and second and very vaguely of the others. Knowledge that it was the 'root-like' figure. I think auditory images 'root-like' were present. A memory knowledge that the last two SABOMS were *small relatively to the others*, and a knowledge equivalent to '*well, if that is so, the fourth must be small.*' Word 'small' auditory-kinaesthetically. Reacted." Observer E., R.T. 2148, fall 0.2 per cent., prot. 42. See phot. 3 in Fig. XVIII.

(4) THE GREEN PETUL IS (lying on its face). Introspection: "Read stimulus. Then *intentional direction* towards first and second PETUL, both extremely vague and indeterminate, but the knowledge that neither was green. Then *intentional direction* towards third PETUL. A belief that its sinus was at the bottom of the picture and that it was green. There was *consciousness of action* and *direction* in all this. Belief that *I could not* recall the other two. Without much conviction a mental state equivalent to: 'oh, well let it be so.' This was certainly *volitional* in the sense of acceptance but there was no *introspectible consciousness of action*. Reacted 'lying on its face,' which came auditory-kinaesthetically." Observer E., R.T. 3720, fall 2.1 per cent., prot. 59. See phot. 4 in Fig. XVIII.

(5) SOME BOGIL ARE (pretty). Introspection: "Read stimulus auditory-kinaesthetically. Astonished at 'some.' A knowledge that any judgment about 'all BOGIL' would satisfy task 'some BOGIL.' Definite knowledge of abstract BOGIL with some slight contamination of the first BOGIL as symbolic. Reaction word 'pretty' came auditory-kinaesthetically. A knowledge that it would apply to all BOGIL, but with *consciousness of action I definitely restricted the meaning to some.*" Observer E., R.T. 1833, fall 1.25 per cent., prot. 40. See phot. 5 in Fig. XVIII.

Changes in apparent resistance of E. recorded synchronously with the processes described in the protocols quoted are in Fig. XVIII. Photograph 1 shows a normal curve of the fall of resistance when the only conation reported occurred in the first period of the reaction, viz. during the determination of the meaning of the subject. We have seen previously that in most cases conation is involved in cognitive processes of that period. The curve in photograph 1 shows also a normal recovery until the resistance of the observer is re-established to its initial state.

In photographic record 2 recovery of the resistance was interrupted 9 seconds after it began to fall. R.T. is 8257, which means that this stop coincides with the end of reaction. From protocol 39, quoted under (2) we see the cause of this arrest in recovery. Observer E. "with slight feeling of activity" stops the reaction. Thus the arrest of the rise of resistance means another fall of resistance caused by a new pulse of activity. But since this was only a "slight activity" it could not have such an effect as to produce another marked deflection. We shall see such a marked second deflection in the examples to be shown for other observers. It is probable, however, that the activity reported in the protocol is of a volitional rather than a conative character. To stop the reaction means primarily a voluntary act or adoption of an attitude on the part of the observer with regard to the task imposed upon him. That this attitude was partially forced by the situation itself gives a conative character to the volition. And we think that this conative character has produced that slight second deflection in the curve.

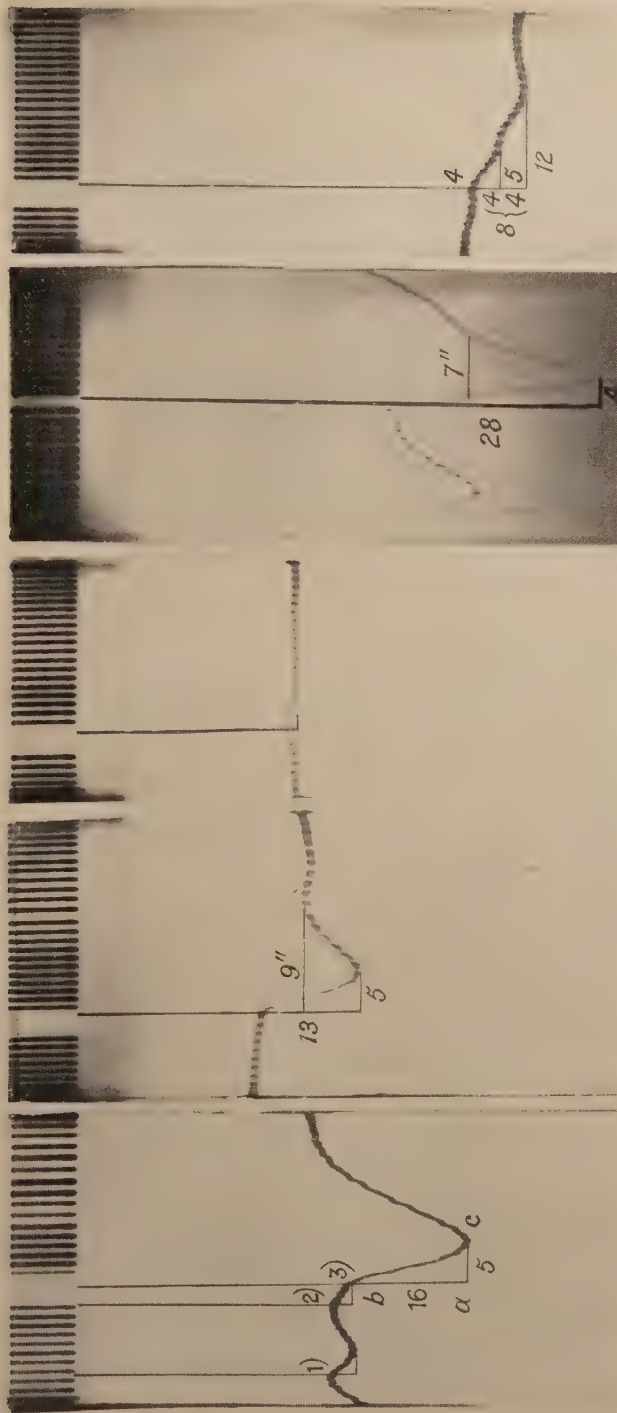
In the protocol quoted under (3) processes reported indicate operations on a higher cognitive level; no activity was reported and practically no deflection in the curve occurred (see photograph 3).

In the protocol quoted under (4) intentional direction with consciousness of action was reported as involved in the determination of the meaning of the subject and to that period of activity correspond 2.1 per cent. of resistance. A volitional activity without any introspectible consciousness of action was reported at the end of the reaction; and there was practically no change in the normal recovery of resistance. Whereas the consciousness of action as a conational character of activity caused a big deflection at the beginning of the reaction.

In the last quoted protocol we have knowledge of a "rule" reported at the beginning and all other processes are on a "higher level." The first fall of resistance corresponding to this period is very small. What makes the total fall as big as 1.25 per cent. is a second fall caused by consciousness of action in restricting the meaning of the subject, occurring about the end of reaction.

Further examples are as follows:

NO DIPUV IS (yellow). Introspection: "When I saw the stimulus there was a little start when I saw that it was a negative one. Then some rather *hurried activity in an effort* to get some adjective for judgment. 'Round' came. I knew I had given that word before. Then a blank. It was a cognitional blank, I was *still striving* for something. Then yellow came and I felt in my



1

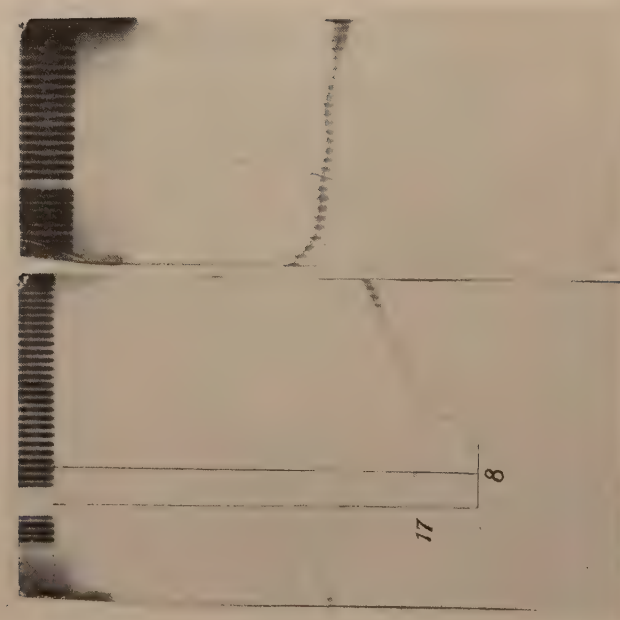
2

3

4

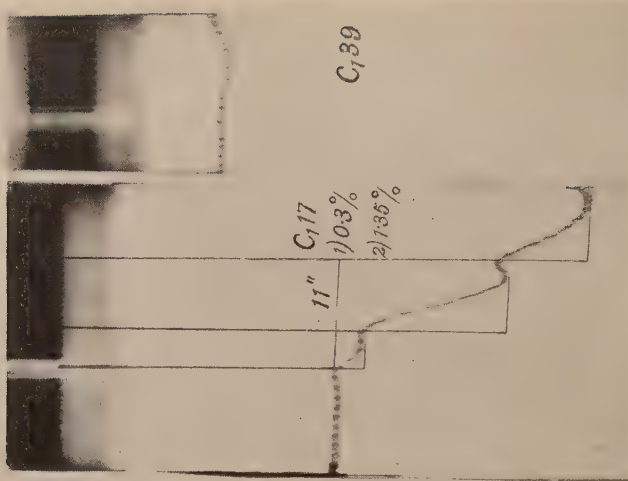
5

Fig. XVIII.



1 Fig. XIX.

2



1 Fig. XX.

2

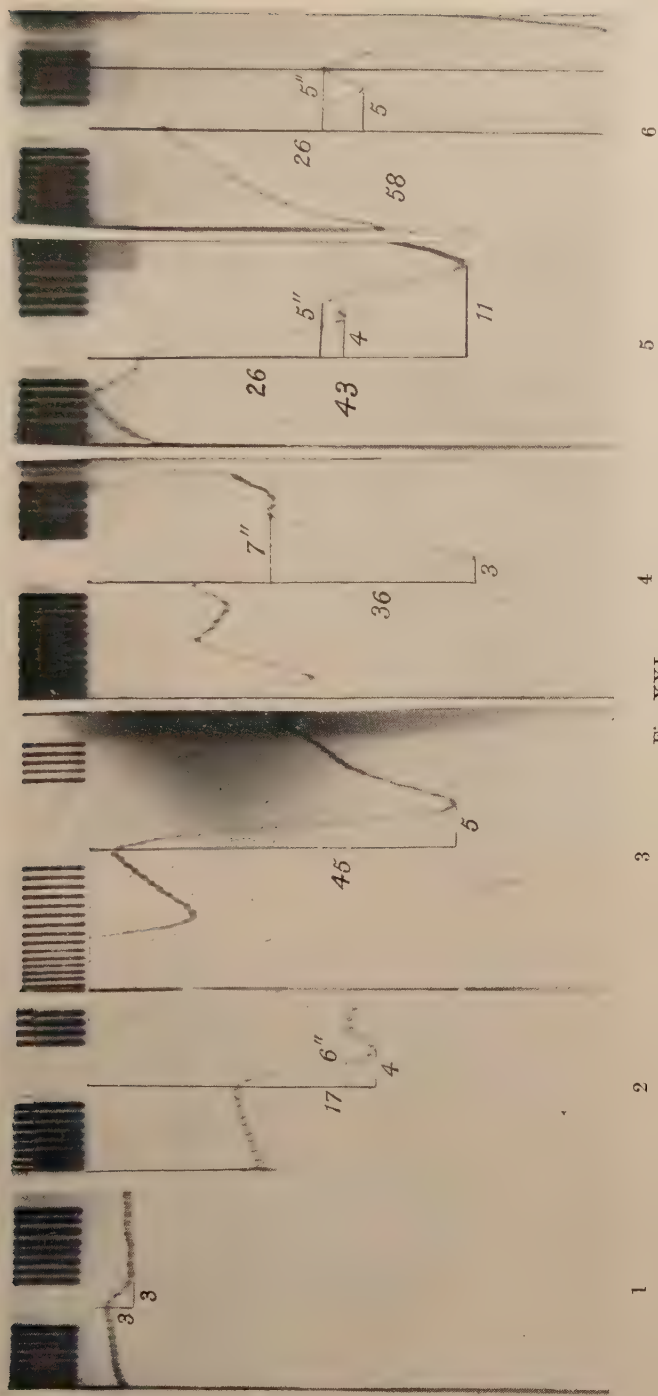


Fig. XXI.

tongue kinaesthetic feeling of pronouncing 'yellow.' I knew that that was all right, because I knew there was no figure of any kind yellow. I gave: 'No DIPUV is yellow.' There was never any consciousness of the general scheme for DIPUVs, nor of any individual DIPUV." Observer A., R.T. 3197, fall 2.35 per cent. See phot. 1 in Fig. XIX.

GREEN DIPUV IS (fourth). Introspection: "I read the stimulus. Then there was a general knowledge of the particular shade of green, then the knowledge of the green DIPUV, its shape and size with an image. Then *the least bit of hesitation* and the hazy knowledge that there are two series with green figures pretty much the same; but *I decided* that the green DIPUV is fourth in its series and gave that judgment verbally." Observer A., R.T. 1453, fall 0 per cent., prot. 72. See phot. 2 in Fig. XIX.

Photographic record 1 in Fig. XIX shows two deflections corresponding to a prolonged effort as reported in the first quoted protocol of A. In the second protocol there was no conation reported (except a slight hesitation). A "decision" only was reported, i.e. activity of a volitional character and there was practically no deflection in the corresponding photographic record (2 in Fig. XIX).

Further examples are as follows:

THE THIRD SABOM IS (—). Introspection: "Read 'the third SABOM is.' Blank. I made an *effort* to obtain a key to the series and after a moment I had a knowledge of a picture which I recognised as the first. I *tried* to use this as the stepping-stone to the third. There was a *hold up* and I realised that I should have some *difficulty*. Then I made a *strong effort*, but could not obtain anything. Then vague knowledge of some pictures arose and after a short consideration I *rejected* this as belonging to another series. There were thoughts of reaction time becoming long. Then I made *another effort*. This was followed by a feeling that I should be unable to fulfil the task and I *decided* to give it up with the feeling of annoyance. Reacted: 'I don't know.'" Observer C., R.T. 10,119, fall 0.3 per cent., 1.35 per cent., 1 per cent., prot. 17. See phot. 1 in Fig. XX.

SOME BOGIL ARE (red). Introspection: "I read 'some BOGIL are.' I was aware vaguely almost at once of the whole series. Their colours were present (one or two images). I *decided* to respond with red and reacted at once 'some BOGIL are red.' The bright red was present. Then immediately after, there was knowledge that there was only one bright red picture, but that the others were of reddish hue." Observer C., R.T. 1998, fall 0.1 per cent., prot. 39. See phot. 2 in Fig. XX.

In the first of these two protocols conation is three times reported. The last reported activity is volition (decision to stop the reaction). The photographic record 1 in Fig. XX shows exactly all three pulses of activity. In the second protocol no other activity than that of volition is reported. The photograph 2 in Fig. XX does not show any deflection.

The following four protocols represent the introspections of B. This observer has been repeatedly mentioned for his *visual and verbal*

imagery, for his *tentative judgments*, his great *intensity of conation* involved and his *indicative predication*. Unfortunately, as we have mentioned before, we could not obtain any satisfactory photographic records for this observer on account of his extremely high resistance and general instability.

Protocols are as follows:

THE FIFTH LUMIG IS (assent to a red image). Introspection: "I read the word 'fifth' at first and there was an *intentional direction* towards the right end of the series. There was no meaning of LUMIG at that time. I repeated the word LUMIG and first a *brown image*, then a *blue* one appeared fairly clear in shape. I turned away from this, concentrated on the other end and the word 'red' appeared in consciousness and immediately a *red image* of fairly determinate shape developed. I seemed to make an *effort towards this* as if it was *something I was going to grasp*. There was a feeling of conviction and confidence. That *assent* was the judgment which was not formulated any more than that." Observer B., R.T. 5561, prot. 14. (Res. 100,000/10.)

NO PIMEF IS (has four corners). Introspection: "When I read the type of task I had a feeling of *difficulty*. The words 'no PIMEF is square' came first. There was a *tendency to reject* that as totally irrelevant, then the knowledge came: 'no PIMEF has four corners.' Then a vague knowledge of my general meaning of PIMEF developed as a figure having five branches, and there was a distinct feeling of being drawn towards that last judgment. I reacted." Observer B., R.T. 4885, prot. 22.

SOME PETUL ARE (pink). Introspection: "As soon as I saw the word, predicate 'like flowers' came as words. There was a distinct *rejection* of this, almost as if I had *drawn back* physically. Then it seemed as if I *radiated energy* in another direction. It was almost as if *from me located force went out* in another direction. During that moment of *striving* in a fresh direction *consciousness was very empty*. There was certainly no knowledge of the task present, but at the end of this direction (of force) the word 'pink' appeared and I *assented* to that with the feeling of correctness and satisfaction." Observer B., R.T. 2652, prot. 26. (Res. 80,000/10.)

THE FIRST PETUL IS (pink). Introspection: "First of all I read the words: 'the first PETUL is' without much meaning. Then the meaning of PETUL flashed in with the words 'like flowers.' There were some very vague images, then one—pink one took on clearer shape and I gave a sort of *assent* to that, my completion being 'the first PETUL is pink.' In that *assent* it was as if *something went out from myself to the image* which seemed to be located outside." Observer B., R.T. 4178, prot. 12. (Res. 107,000/10.)

The following protocols represent introspections of D., who is a visualiser, and who sometimes assents in predicating in the same way as B. (quoted in the foregoing) does. He showed the greatest sensitivity with regard to the galvanic reflex—his average fall of resistance for all experiments being 2.42 per cent.

The introspections are as follows:

SOME BOGIL ARE (red). Introspection: "As soon as I saw stimulus I had a fragmentary image of one of the middle BOGILS with a knowledge of redness.

There was no particular reference to their position and at first to their number. Then came knowledge that at least two of them were red, but that all except the first may be regarded broadly speaking as 'reddish' (pink included). Reacted 'red.' Reaction was very smooth and easy." Observer D., R.T. 4641, fall 0.5 per cent., prot. 95. See phot. 1 in Fig. XXI.

THE THIRD PETUL IS ("that"). Introspection: "I was expecting buzzer in fore period. Shutter fell, I saw 'the third PETUL is' but I did not cognise it at once; so I looked once more. There was an *intentional direction* at once towards the third place in the series. *I did not get anything* at first. Then came the first PETUL, then the second. Then there was *strong tension* with direction from the second place to the right, then a pause, and in *another pulse of tension* I had knowledge of the fourth 'humped' figure. I did not recognise it clearly as fourth, but I *shifted my attention* backwards and got small rounded rose-pink image of which the most prominent part was 'sinus' in the middle turned downwards. I had a feeling that time was long and I *decided* to react and did so not finding any word for my predicate but making a *mental nod* as an acceptance of it." Observer D., R.T. 6086, fall 2.9 per cent., prot. 75. See phot. 2 in Fig. XXI.

SOME PETUL ARE (flower-like). Introspection: "When I saw stimulus I was at once conscious that this would be a particular judgment, 'some' being prominent. With *intentional direction* towards the series I had a green image with its right hand side 'hump' prominent and conscious that there was no other green PETUL, the other being intended as not similar in colour. There was a *striving* to find some of them with a common character to themselves and different from the others. Consciousness of redness came as a colour of broad character that could include all others except the green one. During that time only the first was intended and a vague reddish-pink image appeared. I did not accept the colour as a distinguishing character, so I turned to the shape. There was a consciousness that 'hump' was a predominant character in all of them. Then word auditory-kinaesthetically 'flower-like' appeared, but it was referred only to the first figure. Then with a *distinct act of acceptance*, in which there might have been *some conation*, and after some *hesitation*, I assented to this word being conscious that although only the first PETUL was flower-like, some of them, except the green one, might be forced by a stretch of imagination into flower-like shape." Observer D., R.T. 7597, fall 3.4 per cent., prot. 110. See phot. 3 in Fig. XXI.

SOME LUMIG ARE (brown). Introspection: "When I saw stimulus I recognised it as a particular one. I had the general meaning of LUMIG represented by a very schematic image, colourless and applicable to any one of them. 'Some' was prominent with consciousness that it would be rather *difficult* to *particularise here*; and I *began a review of different pictures starting from* the fourth pink LUMIG which is my symbol for the series. I knew that it was pink and I was waiting for some others to come while my *attention was shifting* to the left from it. The knowledge that there is a brown one to the left from it and then another brown further to the left. That knowledge I *accepted as enough* to complete the sentence and I said in *loud voice* 'brown.' All the time there was a sort of oscillation of pink and brown images." Observer D., R.T. 6074, fall 3.55 per cent., prot. 105. See phot. 4 in Fig. XXI.

THE SECOND SABOM IS (like violin bridge). Introspection: "As soon as I saw stimulus there was *direction of attention* towards the second SABOM. I got then a brown *image of* which two projections facing downwards, were very

prominent. There was thought: 'this might not be SABOM.' With *direction of attention* towards the first SABOM which was not present as image I was reassured that image I had is SABOM. Then there was a *period of choosing* a predicate and auditory-kinaesthetically words 'facing downwards' were present. I *rejected* that, and I was still examining present image. Then the thought of 'violin bridge,' followed by the same word auditory-kinaesthetically, came and I *accepted* that not pronouncing it." Observer D., R.T. 5088, fall 4.05 per cent., prot. 45. See phot. 5 in Fig. XXI.

THE FIFTH PIMEF IS (green). Introspection: "When I saw stimulus and after a short pause, there was *searching with direction of attention* towards end of series. I got an image (colourless) with knowledge of greenness and thought it was fifth. Image was very vague and scrappy and did not give me any clue as to position and detailed shape of the picture. There was intentional knowledge of some pictures backwards from the fifth, with a thought that they are of the same type. I *accepted* the fifth as green and *did not decide* only what to say. There was auditory-kinaesthetically 'green' present and then 'downwards' and I *said aloud* 'green' and *in a low voice* 'down.'" Observer D., R.T. 4746, fall 4.1 per cent., prot. 43. See phot. 6 in Fig. XXI.

QUANTITATIVE DATA.

Examples quoted individually in the foregoing show dynamic states both introspected as present in consciousness and indicated by the psychogalvanic reflex. We have quoted individual cases primarily with the view to show that the sequence of different forms of activity was not only introspected by our observers but was also indicated by changes in their apparent resistance. When the activity reported consisted in a volitional act ("decision," in the examples quoted) these changes were very small or were quite absent. In the cases in which there was a second fall of resistance occurring about the end of the reaction and at that moment a volition occurred (as reported in introspection), that fall may be accounted for by conation which was not always explicitly reported but which, judging from the situation, may reasonably be inferred to have actually occurred. The movement of reaction itself, in which conative elements are involved, might have produced the reflex. Two observers (e.g. A. and D., especially D.) report in some special cases conation involved in the pronouncing of the predicate in a *loud voice*.

While the changes in apparent resistance, in all the cases quoted, indicate the presence of a conative activity, they do not always correlate with it quantitatively. The amount of the recorded percentage fall of resistance does not always correspond with the intensity of conation reported on the subjective side. That any exact quantitative correlation sometimes does not occur is to be expected. On the one hand, we do not yet know all the causes which produce

the reflex; on the other hand, the observers engaged in a cognitive operation may not always report conation occurring at the same time. And, if they report it, they may not be able to determine its quantitative character. Thus, when we tried to determine the correlation between the amounts of the percentage fall in resistance and the degrees of intensity of conation, as indicated by the introspections of three of our observers, we were able to find such correlation only in the case of two of them (D. and E.). This is the reason why we looked for such a quantitative correlation in the solutions of tasks of different degrees of difficulty. Classification of the results obtained according to the different kinds of judgments made, presents entirely an "objective" basis for the correlation in question. We know which judgments are difficult for different observers; and we already possess some data with regard to their individual differences, which have previously been considered.

Table XIV.

Averages of reaction times in different kinds of judgments for all five observers.

Observer	<i>G</i> *	<i>E</i>	<i>A</i>	<i>I</i>	<i>SA</i>	<i>O</i>	<i>SN</i>
A.	1588	2590	1859	2683	2166	3371	2766
B.	3205	5303	2819	4075	5248	4614	3454
C.	2679	3354	3724	3465	2669	5600	3914
D.	3854	5034	4184	6167	4536	5462	4918
E.	1156	1473	1744	2500	2593	3511	3970
Average	2496	3551	2866	3778	3426	4817	3804

In Table XIV different kinds of judgment show different lengths of reaction time during which they were completed. When we grade all the reaction times for each observer, beginning with the shortest one, the ranks (designated by the letters of the respective judgments) will be as in the following table.

Table XV.

Observer	1	2	3	4	5	6	7
A.	<i>G</i>	<i>A</i>	<i>SA</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>O</i>
B.	<i>A</i>	<i>G</i>	<i>SN</i>	<i>E</i>	<i>O</i>	<i>SA</i>	<i>E</i>
C.	<i>SA</i>	<i>G</i>	<i>E</i>	<i>I</i>	<i>A</i>	<i>SN</i>	<i>O</i>
D.	<i>G</i>	<i>A</i>	<i>SA</i>	<i>SN</i>	<i>E</i>	<i>O</i>	<i>I</i>
E.	<i>G</i>	<i>E</i>	<i>A</i>	<i>I</i>	<i>SA</i>	<i>O</i>	<i>SN</i>

* *G* denotes General Affirmative Judgment, *E* Universal Negative, *A* Universal Affirmative, *I* Particular Affirmative, *SA* Individual Affirmative, *O* Particular Negative, and *SN* Individual Negative (Singular Negative).

Before we interpret Tables XIV and XV, we give the averages of the percentage falls in apparent resistance for the three observers (A., D. and E.), as follows:

Table XVI.

Averages of percentage falls in apparent resistance during the mental processes involved in different kinds of judgments (for three observers).

Observer	<i>G</i>	<i>O</i>	<i>A</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>SA</i>
A.	1.22	1.62	1.15	0.80	1.02	1.17	0.65
D.	2.08	2.05	2.00	2.32	2.93	2.57	2.54
E.	0.84	1.08	1.20	1.22	1.38	1.62	2.37
Average	1.38	1.58	1.45	1.45	1.80	1.78	1.85

For easier comparison, we shall rank the percentage falls in the same way as we have ranked the reaction times in Table XV, this time beginning the rank with the smallest percentage fall. The ranks are as follows:

Table XVII.

Observer	1	2	3	4	5	6	7
A.	<i>SA</i>	<i>E</i>	<i>I</i>	<i>A</i>	<i>SN</i>	<i>G</i>	<i>O</i>
D.	<i>A</i>	<i>O</i>	<i>G</i>	<i>E</i>	<i>SA</i>	<i>SN</i>	<i>I</i>
E.	<i>G</i>	<i>O</i>	<i>A</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>SA</i>

Finally we shall give in the two following tables the averages of the velocity of the fall in resistance for the same three observers (XVIII) and their respective ranks (XIX).

Table XVIII.

Averages of the velocity of the fall in resistance for three observers (A., D. and E.) during the completion of different kinds of judgments.

Observer	<i>G</i>	<i>O</i>	<i>A</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>SA</i>
A.	2.72	4.15	2.48	1.54	2.01	2.70	1.59
D.	3.40	3.55	3.30	3.13	4.46	4.38	3.43
E.	1.81	2.87	2.74	2.72	2.31	2.75	4.19
Average	2.64	3.52	2.84	2.46	2.93	3.28	3.07

Table XIX.

Ranks of the averages in velocity of fall in resistance during the completion of different kinds of judgments (rank beginning with the slowest fall).

Observer	1	2	3	4	5	6	7
A.	<i>E</i>	<i>SA</i>	<i>I</i>	<i>A</i>	<i>SN</i>	<i>G</i>	<i>O</i>
D.	<i>E</i>	<i>A</i>	<i>G</i>	<i>SA</i>	<i>O</i>	<i>SN</i>	<i>I</i>
E.	<i>G</i>	<i>I</i>	<i>E</i>	<i>A</i>	<i>SN</i>	<i>O</i>	<i>SA</i>

Reaction times taken alone already point towards some individual differences with regard to our observers and the different degrees of difficulty experienced by them with regard to the operations involved in different kinds of judgments. The General and Universal Affirmative, and for some observers Universal Negative Judgments, show in general shorter reaction times than all other judgments. The exception in this respect is only observer C., who was noted during the learning period for his prolonged "interpretation" of the pictures. It was then mentioned that his meanings of individual pictures¹ developed at the expense of the general meanings of the sets. The result of this is that his Individual Judgments, as shortest in reaction time, come first in rank, whereas his Universal Affirmatives come only fifth. The Individual Affirmative Judgments show relatively short reaction time also in the case of observer A. (third place in rank). A. has been already noted for his memory of colours which were primarily differential characters of the individual pictures in our material. General Affirmative Judgments show the shortest reaction time of all judgments for all observers except for C. already mentioned. When we consider the "analytic" nature of predication in these judgments (character "read off") and when we know that general meaning need not be very determinate in order that the predicate may be "analysed" out of it the short reaction time in these judgments is accounted for.

For all the observers, again, except C., the General and Universal Affirmative Judgments go closely together with regard to their reaction times. We have previously seen that the nature of these two types of judgment is identical from the point of view of the task imposed. Negative Judgments, in which the predication consisted in the higher cognitive operation of educing relations have generally longer reaction times than affirmative ones. An exception to this is

¹ Cf. "interpretation," "over-structuration" and full determination of individual pictures, *ante*, pp. 10, 16, 19, 32.

the Universal Negative Judgment. The reason for this is that in all negative judgments other than universal the meaning of one or several "individuals" had to be obtained before the eduction of the predicate could be made. In this respect Particular Affirmative Judgments (*I*) involve a similar operation (division, oppositeness, "elimination") to that involved in Particular Negative Judgments. They both show generally the longest reaction times. But as compared with one another Particular Negative Judgments required a longer time for completion than Particular Affirmatives.

When we grade the total averages in different kinds of judgments for all the five observers (from Table XIV) we obtain their ranks as follows: *G* (2496), *A* (2866), *SA* (3426), *E* (3551), *I* (3778), *SN* (3804), *O* (4817).

General (*G*) and Universal (*A*) Affirmative Judgments have the shortest reaction time; then comes the Individual Affirmative (*SA*); and finally negative and particular judgments (*E*, *I*, *SN*, *O*). The Individual Affirmative Judgment has a longer reaction time than General and Universal Affirmatives, because of the necessary "determination" of its subject (i.e. the meaning of an individual picture). On the other hand, it has a shorter reaction time than Particular Affirmative and Negative Judgments in general, because it does not involve as high a cognitive operation in educing the predicate as these judgments require.

We shall now see whether and how far the reaction times in different kinds of judgments correlate with the changes in apparent resistance of the three observers (*A.*, *D.* and *E.*) while they were making the respective judgments. Their respective reaction times, percentage falls in resistance and velocity of the falls (taken from Tables XIV, XVI and XVIII) are as follows:

Table XX¹.

Ob- server		1	2	3	4	5	6	7
A.	R.T.	<i>G</i> (1588)	<i>A</i> (1859)	<i>SA</i> (2166)	<i>E</i> (2590)	<i>I</i> (2683)	<i>SN</i> (2766)	<i>O</i> (3371)
	% falls	<i>SA</i> (0.65)	<i>E</i> (0.80)	<i>I</i> (1.02)	<i>A</i> (1.15)	<i>SN</i> (1.17)	<i>G</i> (1.22)	<i>O</i> (1.62)
	Vel. of falls	<i>E</i> (1.54)	<i>SA</i> (1.59)	<i>I</i> (2.01)	<i>A</i> (2.43)	<i>SN</i> (2.70)	<i>G</i> (2.72)	<i>O</i> (4.15)
D.	R.T.	<i>G</i> (3854)	<i>A</i> (4184)	<i>SA</i> (4536)	<i>SN</i> (4918)	<i>E</i> (5034)	<i>O</i> (5462)	<i>I</i> (6167)
	% falls	<i>A</i> (2.00)	<i>O</i> (2.05)	<i>G</i> (2.08)	<i>E</i> (2.32)	<i>SA</i> (2.54)	<i>SN</i> (2.57)	<i>I</i> (2.93)
	Vel. of falls	<i>E</i> (3.13)	<i>A</i> (3.30)	<i>G</i> (3.40)	<i>SA</i> (3.43)	<i>O</i> (3.55)	<i>SN</i> (4.38)	<i>I</i> (4.46)
E.	R.T.	<i>G</i> (1156)	<i>E</i> (1473)	<i>A</i> (1744)	<i>I</i> (2500)	<i>SA</i> (2593)	<i>O</i> (3511)	<i>SN</i> (3970)
	% falls	<i>G</i> (0.84)	<i>O</i> (1.08)	<i>A</i> (1.20)	<i>E</i> (1.22)	<i>I</i> (1.38)	<i>SN</i> (1.62)	<i>SA</i> (2.37)
	Vel. of falls	<i>G</i> (1.81)	<i>I</i> (2.31)	<i>E</i> (2.72)	<i>A</i> (2.74)	<i>SN</i> (2.75)	<i>O</i> (2.87)	<i>SA</i> (4.19)

¹ This table, as is clear, simply presents the different kinds of judgments in order, according to reaction times, percentage fall, and speed of fall.

The averages for all the three observers with regard to reaction times, percentage falls of resistance and velocity of the falls are as follows:

Table XXI.

		1	2	3	4	5	6	7
Av. for ob- servers A., D. and E.	R.T. % falls Vel. of falls	G (2199) G (1.38) E (2.46)	A (2892) A (1.45) G (2.64)	E (3032) E (1.45) A (2.84)	SA (3098) O (1.58) I (2.93)	I (3783) SN (1.78) SA (3.07)	SN (3885) I (1.80) SN (3.28)	O (4114) SA (1.85) O (3.52)

When we plot the values in Table XX for each observer, we obtain their respective curves in Figs. XXII, XXIII and XXIV respectively. The curves plotted for all three observers (from Table XXI) are represented in Fig. XXV¹.

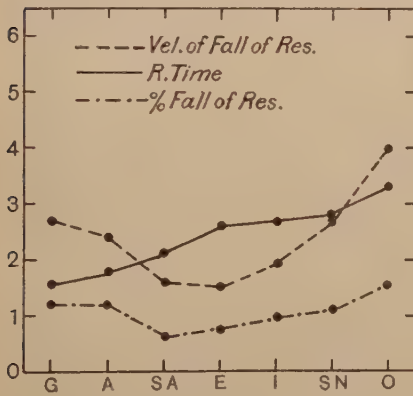


Fig. XXII. Observer A.

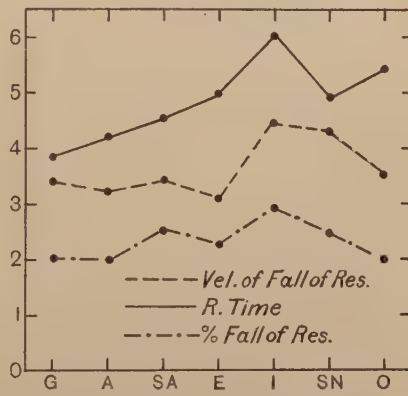


Fig. XXIII. Observer D.

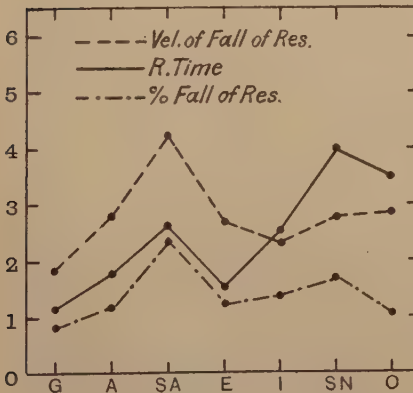


Fig. XXIV. Observer E.

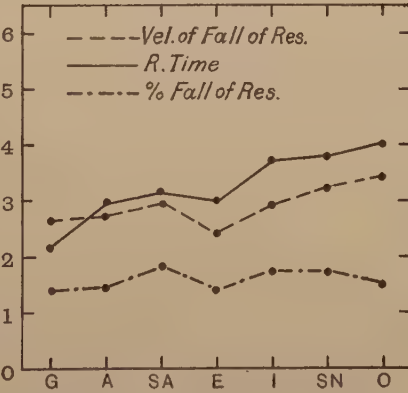


Fig. XXV. Observers A., D. and E.

¹ See footnote on p. 127.

From the inspection of Table XXI and Fig. XXV we see that the percentage falls of resistance for three observers do not correlate exactly with their reaction times in all the kinds of judgments. While the reaction time rises in passing from analytic to synthetic judgments, viz. from those in which one character is "read off" as predicate, to those which require the higher operations of relation and correlate educing, the percentage fall rises only to some extent. On the other hand, some judgments which do not require a long reaction time for their completion show relatively large percentage falls in resistance. The best example of this is the Individual Affirmative Judgment. This, for all three observers, represents a middle position in the rank of all the judgments with regard to its reaction time (4th place in Table XXI); whereas its percentage fall of resistance stands higher than that of any other judgment (7th place). We have previously submitted that, with regard to cognitive processes conation is particularly involved in those which occur on a sensorial level, and those of mere reproduction in general¹. The quantitative data presented here corroborate our previous statement with regard to individual judgments, in which such processes are involved to a greater extent than in any other judgments. Individual Negative Judgments, for the completion of which it is necessary to have the meaning of an "individual," required in addition to this the higher cognitive operation of educing the predicate as a different character from that apprehended in the meaning of the subject. They show much longer reaction times than the Individual Affirmative Judgments but a slightly smaller percentage fall of resistance than these. They rank, however, higher in this respect than any other judgment except the Particular Affirmative (*I* in 6th place, Table XXI); which also involved cognitive processes both of a reproductive ("reviewing" several individuals) and an eductive order (division, elimination, opposition).

With regard to different observers taken separately these show several individual differences. We have previously pointed out that observer A. had a very good memory for colours. Whenever an individual judgment is presented to him for completion, a colour comes as an item of knowledge which he in most cases "verifies" and then accepts as the predicate. This is the reason why individual judgments were very easy for him; and he shows the lowest percentage fall of resistance in these judgments (Fig. XXII). On the

¹ Cf. *ante*, pp. 119, 120.

other hand, to reproduce the meaning of an individual picture was the most difficult task for observer E.; and he consequently shows the largest percentage fall in Individual Affirmative Judgments. We have previously noted on several occasions that this observer dealt with relation—and correlate—educing better than any other observer. In Fig. XXIV, he shows a manifest discrepancy between the reaction times and the percentage falls of resistance in the judgments in which relations were primarily involved (*I, SN, O*). Observer D. obtained relatively better meanings for individual pictures than observer E. (although not as good as observer A.); moreover he is a *visualiser*. His percentage falls of resistance in individual judgments, both affirmative and negative, are relatively very large, the largest percentage occurring in his Particular Affirmative Judgments.

The differences between individual observers do not consist only in the cognitive operations which they employ according to their type. There is a sort of "mental set" in the behaviour of a particular observer with regard to a particular judgment. When such a judgment is presented the observers in question display a certain *alertness* associated particularly with that kind of judgment as soon as they perceive the stimulus. Their conation is thus discharged independently of the degree of difficulty which may be involved in the cognitive operations necessary for that particular case. In other words, "mental set" discharges "mental energy" according to the *KIND of stimulus* ("Some — are not") although a particular stimulus ("Some *BOGIL* are not") may be of a *difficult "kind"* but of an *easy "variety" of solution*. Such particularly difficult judgments were: Particular Negatives for observer A., Particular Affirmatives for D. and Individual Affirmatives for E. We have previously shown that observer A. reported "'some are' is quite difficult, but 'some are not' is not worth while trying." Although any one *special case* of this *kind* ("some — are not") may not be very difficult for him, when he comes to make his judgment the mere apprehension that the stimulus has to do with a judgment of this *kind* arouses his "*alertness*."

In order to illustrate more precisely the differences between different kinds of judgments we show (Table XXII) the percentage differences of reaction times and percentage differences of percentage falls of resistance for observers A., D. and E. The judgments were there compared in pairs, viz. Universal Negative (*E*) and Universal Affirmative (*A*); Particular Negative (*O*) and Particular Affirmative (*I*); Particular Affirmative (*I*) and Universal Affirmative (*A*); and

so on. The first judgment of each pair *theoretically involves more resistance than the second.*

Table XXII.

Percentage differences of reaction times and of percentage falls of resistance of three observers between any two kinds of judgment logically different either qualitatively or quantitatively.

Observer		1	2	3	4	5
		<i>E—A</i>	<i>O—I</i>	<i>SN—SA</i>	<i>I—A</i>	<i>O—E</i>
A.	% difference of R.T.	+28.2	+20.4	+21.7	+30.7	+23.2
	% difference of % fall	-30.4	+37.1	+44.4	-11.3	+50.6
D.	% difference of R.T.	+16.9	-11.5	+7.8	+32.2	+7.9
	% difference of % fall	+13.8	-30.1	+1.2	+31.7	-11.6
E.	% difference of R.T.	-15.8	+28.8	+34.7	+30.2	+58.1
	% difference of % fall	+1.6	-21.7	-31.6	+13.5	-11.5

To make the data shown in this table clear we take one observer as an example. Observer A. required on an average 28.2 per cent. longer time to complete a Universal Negative (*E*) than a Universal Affirmative Judgment (*A*); his percentage fall in resistance was, however, 30.4 per cent. smaller in the first than in the second kind of judgment. In column 4 he shows 30.7 per cent. longer reaction time and 11 per cent. smaller percentage fall in Particular Affirmative Judgments than in Universal Affirmatives. In the first case (*E—A*) *the reaction time was longer when of two universal judgments one was negative; in the second case (I—A) the time was longer when of two affirmative judgments one involved particularising.* In both cases the percentage DECREASES in percentage fall of resistance. Apparent discrepancies in columns 2 and 5 have already been explained (mental set for Particular Negative Judgments, etc.).

We have previously stated that we are not using the galvanic records of observers B. and C., together with those of A., D. and E., in computing our quantitative data. The reason given was that these two observers showed in most of the experiments a very high resistance; so that in all such cases no measurable changes of resistance were ascertainable.

Out of 140 photographic records there were only 58 in which observer B. gave deflections which could either be measured accurately or be judged with certainty to be 0 per cent. Observer C. had 59 such records. As compared with the number of records for the other observers used in compiling our data A. had 113 out of 140, D. 132 and E. 120. The records of B. and C. represent only a rela-

tively small number of the total. It thus happened that they were not equally well distributed over all the different kinds of judgment. We, however, think it right to present their data in order to compare them with those of the other observers. As will be seen they certainly do correlate with the results for the other three observers; but we present them with a reserve as to their validity.

Table XXIII.

Reaction times and percentage fall of resistance in different judgments for observers B. and C.

Observer		<i>G</i>	<i>A</i>	<i>SA</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>O</i>
B.	R.T.	3205	2819	5248	5303	4075	3454	4614
	% fall	0.80	0.91	0.89	0.41	0.84	1.42	0.38
C.	R.T.	2679	3724	2669	3354	3465	3914	5600
	% fall	— *	0.62	1.36	1.09	1.37	—	—

When we include the data of these two observers with those of the other three we obtain the total averages of reaction times and of percentage falls for all five observers as follows (Table XXIV):

Table XXIV.

		<i>G</i>	<i>A</i>	<i>SA</i>	<i>E</i>	<i>I</i>	<i>SN</i>	<i>O</i>
Average for all five observers	R.T.	2496	2866	3426	3551	3778	3804	4817
	% fall	1.23	1.18	1.56	1.13	1.51	1.63	1.21

In Figs. XXVI and XXVII the curves for B. and C. (from Table XXIII) are shown. In Fig. XXVIII the curves of reaction times

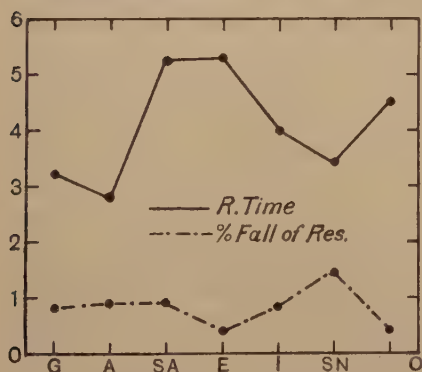


Fig. XXVI. Observer B.

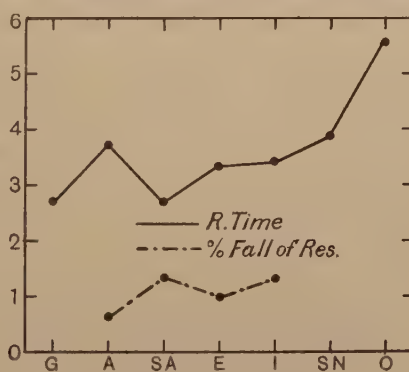


Fig. XXVII. Observer C.

* No data could be obtained for observer C. with regard to the percentage fall of resistance in *G*, *SN* and *O*.

and percentage falls of resistance for all five observers are plotted and given, for comparison, with the curves for the three observers already shown in Fig. XXV.

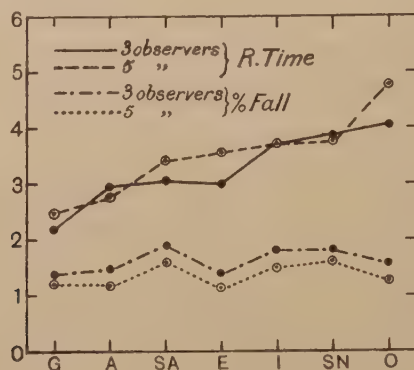


Fig. XXVIII.

GENERAL CONCLUSIONS.

LEARNING PERIOD.

1. In learning individual (unfamiliar) members of a group of pictures, the first member is originally cognised in relation to past experience. Subsequent members are cognised as *meaningful* under the aspect of the relations obtaining between them and the first, or prior members of the group.

2. Growth in knowledge of an individual picture may take place either by slow differentiation of characters, or by the sudden emergence of its structure. Differentiation consists in a growth of relations round a central character (relation) as a nucleus; while emergence of structure depends on the relatively sudden and simultaneous eduction of the system of constitutive relations of the individual picture.

3. Differentiation, because of the appearance of divergent characters, best serves to determine individual meanings. Emergence of the structure, because of the appearance of the constitutive whole of the individual, best serves for the eduction of the constitutive whole of the group; i.e. the abstract concept.

4. The individuals which become determinate by gradual differentiation yield the abstract concept by gradual disintegration of the common characters. Appearance of the structure yields the concept

by free eduction. In the former case, all the individual pictures of the group must be cognised, before a general concept for it is possible. In the latter case, two examples only are necessary.

5. Free interpretation (in the sense of an eduction by analogy, together with associative reproductions) tends to prevent an individual picture from differentiating with regard to its own constitutive whole; and at the same time hinders that individual picture from becoming a constitutive member of its group. Thus any concept, applicable indifferently to all the members of the group may be impeded in its formation.

Observers who tend to interpret the pictures on the basis of association, instead of educing relations between them, failed to form general concepts for the groups with regard to which such failure occurred.

6. Growth of knowledge with regard to an individual member of a group is always progressive. The concept, however, may be formed and grow by disintegration of the common character, either while the individuals are becoming more determinate, or while they are losing their determinateness by obliviscence.

7. In our experiments, confusion as a process of concept-formation never occurred in the case of those groups of pictures, the individuals of which came to be known by structuration; but it sometimes did occur in the case of those the individuals of which came to be known by gradual differentiation. And, in that case, the essential characters of the individuals were not confused, but the differentiating ones.

8. Images were not found to help in determining the meaning of individuals by their intrinsic characters.

9. Schematic images tended to appear as symbols in the case of concepts related to groups of pictures which were very closely similar; while verbal names appeared in cases of less similar pictures. Observers of a visual type tended to schematise, while non-visual observers reported intentions or verbal symbols. The final fixation of the concept tended always to be verbal.

COMPLETION OF PART-SENTENCES.

10. In general, we corroborate the results reached in *The Consciousness of the Universal and the Individual*, F. Aveling.

11. As to *quality* of Judgment, we have found that the subjects of Negative Judgments tend in general to be present as imageless knowledge more frequently than those of Affirmatives. As to *quantity*,

the same observation holds good with regard to Particular, as compared with Universal Judgments.

12. If images play any rôle in Judgments, it would appear that they serve as indications as to *which* individual is meant, but not as to *what* its characters are (cf. Note 8).

ACTIVITIES INVOLVED IN JUDGING.

13. In finding a predicate to apply to the subject, a character obtained by associative reproductive activity is not accepted without verification. Characters obtained by activity guided by relations (directed activity) need no such verification.

14. General, Universal and Individual Affirmative Judgments in our experiments tend to involve analytic process—i.e. the character signified by the predicate is read off from the meaning of the subject. Particular Affirmative, and all Negative Judgments tend to be synthetic.

15. Negative Judgments of the type "No ... is," "Some ... are not," involve the eduction of a correlate from a fundament given together with a relation of difference.

CONATION.

16. Conation is manifest in connection with reproductive processes rather than with eductive.

17. Conation tends to occur in connection with processes taking place on the sensorial rather than on the conceptual level.

18. Our data indicate that there need be no conation in judging (predication) as such; but there may be volition, especially in cases in which insight is deficient.

Further, volition is frequently involved in adopting a rule, plan or method for making the judgment, for its verification, or final acceptance.

OBJECTIVE INDICATIONS.

19. Conation is objectively indicated by bodily changes registered by the Psychogalvanic Reflex.

Volition gives no evidence of being accompanied by such changes.



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